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INNOVATION INSIDE THE BOX:

HOW CONTEXTUAL CONSTRAINTS CAN CONTRIBUTE TO IMPROVEMENT IN HEALTH CARE

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THESIS FOR DOCTORAL DEGREE (Ph.D)

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To my family

"All change seems impossible, but once accomplished,
it is the state you are no longer in that seems impossible."
French Philosopher Alain

ABSTRACT

Background

Health care is becoming increasingly complex because of the major advances achieved in clinical and biomedical knowledge in the last 50 years. Many more important advances are on the horizon that will create opportunities to improve outcomes for patients. However, this promising scientific development is accompanied by the ever-escalating cost of care. This challenge represents a fundamental paradox as health care organizations struggle with how to achieve the "Triple Aim" of better care experience for patients, improved population health, and, at the same time, reductions in per capita health care cost. While downsizing is a common strategy used in health care to reduce costs, this strategy may have negative effects on the quality of care. Thus, innovation and significant organizational changes are needed at all levels. Although Quality Improvement (QI) is one of the predominant approaches to making changes in health care, its application and effectiveness are increasingly questioned and discussed. The Triple Aim framework embodies the challenge of innovating under financial constraints, which has been studied in the business sector. However, constraint driven innovation is not well understood in health care.

Aim

The aim of this thesis is to explore how the (paradoxical) juxtaposition of constraints (such as pairing downsizing with increased quality in patient outcomes and experience) can be used as a driver for innovation in health care design and delivery. The case studied is a Danish OB/GYN department faced with external requirements to reduce costs. The department was required to reduce the number of beds by 36%, the number of nursing staff by 20%, and its budget by 10% while still maintaining a high quality of care and patient satisfaction. More explicitly, this thesis explores change management in pursuit of the Triple Aim from the individual perspective (Study I) and at the organizational level (Study III), validates the Danish version of the Organizational Readiness for Implementing Change scale (ORIC) (Study II), and attempts to explain how the managers addressed external demands without compromising patient outcomes and experiences (Study IV).

Methods

The overall research design was an organizational case study that draws upon multiple data sources and utilizes various data collection and analytical methods. Study I is an interview study of staff's and managers' understandings and the underlying mental models related to the Triple Aim. Study II is a validation study that tests the validity and reliability of the Danish version of the ORIC scale. Study III assesses the organizational readiness for implementing large-scale change in pursuit of the Triple Aim and determines associated factors. Both studies use data from a web-based questionnaire. Study IV is an explanatory case study with a longitudinal design. Multiple qualitative data (i.e. interviews, observations, and documents) were analyzed using a complexity-based leadership framework that combined the Cynefin framework and Adaptive Leadership.

Findings

Study I show that staff and managers identified with the Triple Aim consistent with the divisions that exist between professions and managers. Mental models of change and economics in health care were elicited, and a complex interplay among these mental models was explored. Staff perceived the Triple Aim as a dilemma between quality or economics and a threat to patient care, whereas managers saw a paradox that could inspire them to make improvement efforts. Study II,

which establishes the reliability and validity of the Danish version of the ORIC scale can be used to measure organizational readiness for implementing change in a Danish health care context. Study III reveals a high degree of agreement with the commitment statements but low agreement with the efficacy statements. Managerial status and temporary employment were significant predictors of high efficacy scores. Study IV shows that managers in pursuit of the Triple Aim reframed the efficiency requirement as an opportunity to improve patient care. They chose a "professional path" and systematically analyzed every clinical pathway. They developed appropriate responses for simple, complicated, and complex situations. The locus of responsibility for improvement was shared with, or placed on, staff for the majority of the innovations that were implemented. By analyzing the clinical pathways and developing improvement suggestions, patterns of complex organizational challenges emerged. Appropriate responses that addressed these previously unknown situations also emerged.

Conclusions

The juxtaposition of paradoxical constraints, as framed by the Triple Aim of health care, may be used to drive innovation and improvement in health care. In the face of efficiency requirements, the case studied in this thesis demonstrates that simple, complicated, and complex challenges can be identified, and appropriate responses can be developed. When downsizing requirements are accepted and reframed as stretch goals that resonate with the dominant mental models of change and economics in health care, innovation can occur at the department level. By integrating insights from complexity, this thesis demonstrates how QI efforts can be used to support innovation that achieves the Triple Aim. Managers need to deal with the high levels of uncertainty, including staff's worries and concerns, associated with large-scale and complex changes. Thus, managers may benefit from reframing societal discourse and efficiency demands as stretch goals that resonate with the staff´s professional ethos.

LIST OF PUBLICATIONS

I. **Storkholm, M. H.**, Mazzocato, P., Savage, M., Savage, C. Money's (not) on my mind: a qualitative study of how staff and managers understand health care's Triple Aim. *BMC Health Services Research*. (2017) 17:98

II. **Storkholm, M. H**., Mazzocato, P., Tessma, M.K. Savage, C. Assessing the reliability and validity of the Danish version of Organizational Readiness for Implementing Change (ORIC). *Implementation Science* (2018) 13:78

III. **Storkholm, M. H.**, Savage, C., Tessma, M.K., Salvig, J.D., Mazzocato, P. Ready for the Triple Aim? Perspectives from an Obstetrics and Gynecology department in Denmark. *Submitted.*

IV. **Storkholm, M. H.**, Mazzocato, P., Savage, C. Make it complicated: A qualitative study of how a complexity framework can explain improvement in health care. *Submitted.*

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LIST OF ABBREVIATIONS

OB/GYN	Obstetrics and Gynecology
AUH	Aarhus University Hospital
QI	Quality Improvement
PDSA	Plan-Do-Study-Act
IHI	Institute for Health Care Improvement
ORC	Organizational Readiness for Change
ORIC	Organizational Readiness for Implementing Change
CAS	Complex Adaptive System
CRP	Complex Responsive Processes
DDK	Danish Kroner
LOS	Length Of Stay
PROM	Patient Reported Outcome Measures

1 INTRODUCTION

The science of health care is becoming increasingly complex because of the eruption of clinical and biomedical knowledge in the last 50 years. On the horizon, we face great advances that will create opportunities and improve outcomes for patients (Institute of Medicine, 2012). However, this promising scientific development is accompanied by the ever-escalating cost of care that in high-income countries is projected to continue at an annual rate of 2.1% until 2040 (Dieleman et al., 2017). The challenge represents a fundamental paradox as health care organizations struggle with how to achieve the "Triple Aim" of a better care experience for patients, improved population health, and at the same time a reduction in per capita health care costs (Berwick, Nolan, & Whittington, 2008). To address this challenge, innovation and significant organizational changes are needed at all levels (Berwick et al., 2008; Christensen, C.M, Grossman, J.H, Hwang, 2009; Porter, 2010).

1.1 HEALTH CARE'S TRIPLE AIM

The "Triple Aim" acknowledges the coexistence of different views about the purpose of health care and suggests that all three aims are worth striving for *simultaneously* (Berwick, Nolan, & Whittington, 2008). The Triple Aim was presented as a holistic framework to balance society's requirements, i.e. "whatever constraints policy creates". Explicitly, the framework aims to balance costs with the business model of most health care organizations, whose focus has mainly been to improve care quality in relation to population health (Berwick et al., 2008), rather than to improve the full continuum as suggested in the six dimensions of quality care (safe, timely, effective, efficient, equitable, and patient-centered) (Institute of Medicine, 2001).

The Triple Aim is firmly rooted in an understanding of quality and cost as factors dependent on the function and design of the system, rather than solely as a function of the individual skills of the people who work in that system (Berwick, 2003). Theoretically, an attempt to link clinical outcomes, patient experience, and cost makes sense. Deming (1986) described in his "Chain reaction" model that by investing in quality improvement (QI), costs can be reduced.

The Triple Aim can be used to optimize health care systems; since 2008 it has guided over 100 improvement efforts in ten countries (Bodenheimer & Sinsky, 2014; Whittington & Nolan, 2015). Modern health care organizations continuously aim to achieve greater value for patients and become more efficient, while taking advantage of the new possibilities that technological advances bring (Institute of Medicine, 2012). But despite these technological improvements and rapid innovations, health care falls short on "quality, outcomes, costs, and equity" (Institute of Medicine, 2012). In quality improvement efforts, the cost aspect is especially difficult to address (Whittington & Nolan, 2015). Moreover, the association between cost and quality is inconsistent in the health care context and is dependent on the type of spending and the characteristics of the quality improvement effort (Hussey, Wertheimer, & Mehrotra, 2013; Ovretveit, 2009).

Over the past 40 years, two general trends have emerged to improve efficiency in health care: merging smaller hospitals into larger and often new "super hospitals", and downsizing, reengineering, and restructuring existing health care organizations (Sverke, Hellgren, Näswall, Göransson, & Öhrming, 2008). Both strategies most often include staff reductions as a key approach to cost optimization (Davis, Savage, & Stewart, 2003; Flint, 2003; Naomi Fulop et al., 2002; Leatt, Baker,

Halverson, & Aird, 1997). Yet successful downsizing is generally difficult to achieve (Leatt et al., 1997). This thesis explores the paradoxical tensions of innovating healthcare under financial constraints. It is a challenge shared by many health care systems.

1.2 DOWNSIZING HEALTH CARE

Downsizing strives to improve the performance of an organization by reducing labor costs. Downsizing has been defined to include the following (Leatt et al., 1997):

1. An intentional and deliberate action by the organization
2. Involves a reduction in the number of personnel
3. Focuses on improving efficiency and effectiveness
4. Affects work processes, either intentionally or unintentionally.

However, in the private sector, downsizing often fails to achieve its objectives (cost reduction targets, improved productivity, product quality, and customer satisfaction), and often companies have to rehire staff (Flint, 2003; Leatt et al., 1997). Achieving performance improvement in health care through downsizing has also proven challenging (Leatt et al., 1997).

Several authors have described the negative consequences of downsizing for staff in health care (Brown, Arnetz, & Petersson, 2003). Most studies report on the consequences for nurses. Bourbonnais and Brisson (2005) surveyed nurses from 16 health centers and found a significant increase of "psychological distress" after a major restructuring of the Canadian health system. Furthermore, studies in the US and Scandinavia found that staff (nurses and physicians) perceived that their workload increased after downsizing (Brown et al., 2003; Tataw, 2011). It is reported that the number of staff on sick leave increased (Lindberg & Rosenqvist, 2005). Burnout rates among nurses rise and job satisfaction declines (Nordang, Hall-Lord, & Farup, 2010). Staff burnout is a factor that could conceivably have a detrimental effect on care quality (Panagioti et al., 2018; Wallace, Lemaire, & Ghali, 2009). A downsizing "survivors' syndrome", consisting of a perception of a deteriorating work environment and a belief that this threatens care for patients, has also been described as a condition that can negatively affect nurses' morale, trust, motivation, generate cynicism, and lead to difficulties in managing organizational transitions (B. R. J. Burke, 2002; R. J. Burke, 2003, 2005). Brown (2003) emphasizes that physician and nurses perceive their work environment differently regardless of gender and suggests that managers need to be aware of these differences when planning organizational changes.

Several studies have reported that staff members think downsizing has a negative effect on quality (Arnetz, 1999; Tataw, 2011). Few studies have, however, measured clinical outcomes after downsizing. In Canada, mortality, readmission rates, and access to care were not affected by downsizing. Nor was care quality for low income groups. Despite a shift to outpatient surgeries and a reduction in inpatient days, expenses increased during downsizing and bed closures (Brownell & Roos, 1999). Similarly, in the US, Mick and Wise (1996) found no support for a "positive relationship between downsizing and improved financial performance". Yet research in nurse staffing and education indicates that the number of nurses caring for patients, for example, after common surgery, is associated with the low hospital mortality (Aiken, Sloane, Bruyneel, & Heede, 2015). Nurse competency levels is another important factor (Aiken et al., 2015). Reductions in nurse staffing to cut costs might have adverse effects on patient outcomes (Aiken et al., 2015; Ball

et al., 2018). In this large European study (Aiken et al., 2015), the findings suggest that an increase in nurse workload increases the likelihood of patients dying after common surgery.

The literature clearly points to the possible negative effects of downsizing in health care. In the broader management literature, it has been suggested that downsizing can have both negative and positive effects on innovation. It can negatively affect innovation through deteriorating HR factors, damaged social networks, loss of knowledge, and a disrupted learning capacity. On the positive side, downsizing in the private sector can generate more innovation activities associated with the creation of a flatter organizational structure, the establishment of multi-disciplinary teams, and better teamwork (Mellahi & Wilkinson, 2010). However, the relationship between downsizing and innovation in health care is not well understood nor how this relationship can be improved.

1.3 RESOURCE CONSTRAINED INNOVATION

The challenge of innovating under financial constraints has been studied in other areas (Mellahi & Wilkinson, 2010) where it has been found that innovation is a critical component of business productivity (Omachonu & Einspruch, 2010). In the management literature, the concept of *Resource Constrained Innovation* (Agarwal, Grottke, Mishra, & Brem, 2016) suggests that the scarcity of financial resources can trigger innovation. This is a phenomenon that is mostly described in studies conducted in developing countries.

Innovative organizations often see constraints, not as a cause for complaint, but as a call for new ways of thinking – as the saying goes, "Necessity is the mother of invention". A constraint within a context can force an organization "to identify and adopt novel ways of running its business processes, or spark novel product or service designs" (Immelt, Govindarajan, & Trimble, 2009). Lessons learned from some of the most innovative companies, for example, General Electric, Southwest Airlines, and Toyota (May, 2007), illustrate how constraints can drive innovation in the private sector. For example, Toyota uses an approach where seemingly impossible organizational goals are set to spark innovation. This approach is referred to as "Stretch goals" (May, 2007).

Stretch goals can act as a catalyst to "motivate high performance by mandating creativity and assumption-breaking thinking" (Rousseau, 1997; Sitkin, See, Miller, Lawless, & Carton, 2011). Stretch goals are specific, but at the outset they seem unreasonable and are perceived as impossible to achieve. Stretch goals include four characteristics, the 4 A's: They are properly *aligned* with what is most important for the organization. They are *audacious* – set well, they provide energy, new focus, and act as a rallying point. They are *articulated* clearly, not as fanciful statements disconnected from reality or from the business of the organization. They are also *arduous* in that they require a lot of hard work, new thinking, and some luck to achieve. If they are too arduous, however, people will drop off (May, 2007, p. 142). New thinking –assumption-breaking thinking – is important because it helps practitioners move beyond "good enough" and "satisfice" (=satisfy and suffice) ((Simon, H.A., Models of Man: Social and Rational (1957) as cited in May, 2007).

Organizations that are aware of the constraints under which they operate may have the potential to become more innovative if they are able to integrate the constraints into a constructive and successful innovation process – you have to see the box to be able to think out of it. If constraints are viewed as restrictions in health care, the reduction in beds, staff, and costs could become a driver for innovation. The assumption underlying this thesis is therefore that the Triple Aim of health care can be viewed as a set of constraints that can incite innovation.

1.4 INNOVATION IN HEALTH CARE

Despite a myriad of technological innovations, health care has lagged comparatively behind other sectors in the area of innovating service delivery (Christensen, C.M, Grossman, J.H, Hwang, 2009; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; K Walshe, 2007). Innovation in health services has been defined as follows (Greenhalgh et al., 2004):

> A set of behaviors, routines and ways of working, along with administrative technologies and systems, which are linked to providing or supporting health care, implemented in a planned way, and discontinuous with previous practice and perceived as new by a proportion of key stakeholders, and directed at improvement.

One explanation extrapolated from the public sector could be that health care is not fertile ground for innovation (Borins, 2001). It could also be that the predominant approaches to change in health care do not support service innovation (Mazzocato, Stenfors-Hayes, von Thiele Schwarz, Hasson, & Nyström, 2016), especially since technology by itself is seldom enough to drive a disruptive innovation (Christensen, C.M, Grossman, J.H, Hwang, 2009), the kind of innovation that proponents of the Triple Aim argue is probably needed (Berwick et al., 2008). A third explanation could be that we have not fully understood the relationship between Quality Improvement (QI) and innovation (Palm, Lilja, & Wiklund, 2016). The capability to innovate is often contrasted with continual improvement. This has been described as the difference between the exploration that characterizes innovation processes and the exploitation that characterizes QI (March, 1991). The latter is perhaps the most commonly used way to support service innovation in health care (Kieran Walshe, 2009).

Innovation does not, according to the definition presented above, necessarily have to be new. It is enough if the innovations are new to the implementing organization. This suggests that "innovation" is closely related to "change management" and "quality improvement" (Øvretveit, 2012).

1.5 PERSPECTIVES ON CHANGE IN HEALTH CARE

The change management literature in health care covers a broad spectrum of different theoretical views that include multiple theories and models (Dopson, FitzGerald, Ferlie, Gabbay, & Locock, 2010; Iles & Sutherland, 2001; Kernick, 2006; Plsek & Greenhalgh, 2001). This thesis is grounded in the understanding that the outcomes of change are the result of the complex interaction between content (i.e. what), process (i.e. how), and context (i.e. where) (Pettigrew & Whipp, 1993).

To explore this understanding in-depth, the thesis builds on multiple and complementary theoretical perspectives on change management, specifically quality improvement in health care, mental models, organizational readiness for change, and complexity science. Together, they contribute to our understanding of change at the level of individuals (mental models), the level of organizations (readiness for change), as well as the interaction between content, process, and context (complexity).

1.5.1 Quality improvement in health care

QI is one of the predominant approaches to change in health care, and thus an integral part of the context. In the late 1980s, continuous quality improvement was translated into health care by Donald Berwick, Paul Batalden, and others. They were highly influenced and inspired by Deming and Juran who had studied the application of statistics on processes from Walther Shewhart (M. Best

& Neuhauser, 2005; Deming, 1986). The "*Theory of Improvement*" focuses on understanding, reviewing, and revising production processes using statistically analyzed data in order to "reduce waste, rework, and complexity". It has since been widely adopted in many sectors. Quality improvement strategies, which include different methodologies and tools inspired by the production industry (Grol, 1997; Nicolay et al., 2012; Kieran Walshe, 2009), have been used to improve health care for more than 25 years. One of the most common tools is the Shewhart improvement cycle, often referred to as the Plan-Do-Study-Act (PDSA) cycle. The introduction of quality improvement strategies has signaled a shift from traditional improvement driven by professional knowledge to continual quality improvement that integrates the "Profound knowledge of improvement" (Batalden & Stoltz, 1993; Deming, 1986).

The methods related to the new knowledge of improvement were perceived to resonate and be well aligned with the biomedical paradigm, i.e. how clinicians deal with their patients: from preliminary diagnosis (theory), trial of therapy (action), response within a time frame (prediction), and evaluation of the patient's response (measurement) (Batalden & Stoltz, 1993). The Institute for Health Care Improvement (IHI) and others have popularized this thinking, with multiple QI guides and tools (Institute for Healthcare Improvement, 2017). For example, the Model for Improvement by Langley and Nolan et al. (1996) prefaces the PDSA cycle with three questions:

1. What are we trying to accomplish?
2. How will we know that a change is an improvement?
3. What change can we make that will result in improvement?

The goal of the three questions is to set aims that are time-specific and measurable, establish measurements that quantitatively can determine if changes actually lead to improvement, select changes either based on ideas from people working in the system or from others that have experienced successful change, and finally to test changes with the PDSA iteratively in the actual setting where it is to be implemented. The Model for Improvement has spread widely over the last two decades (Taylor et al., 2014). It became the focal point of the Central Denmark Region's Improvement Strategy in 2017.

Nevertheless, the effectiveness of different tools and methods, such as PDSA, Lean, and QI collaboratives are continuously debated and their application in complex health care contexts can be difficult (Mazzocato et al., 2016, 2014; Taylor et al., 2014; Wells et al., 2018). Even though these initiatives may have increased staff´s focus on patient safety and efficiency, it is often difficult to prove that better care is provided for patients (Braithwaite et al., 2017).

The technical focus on tools and methods that we see in many quality improvement related initiatives, such as Lean (Mazzocato, Savage, Brommels, Aronsson, & Thor, 2010), suggests that efforts to improve health care have in practice largely focused on the content of the changes. Realistic evaluation (Pawson, R & Tilley, 1997) and other research approaches have described change as often involving complex social interactions where the context in which the change occurs is highly relevant to the ultimate success of that intervention (Pawson, R & Tilley, 1997). In the pursuit of the Triple Aim, it has been argued that quality improvement should be part of the daily work for frontline staff (Swensen, Pugh, McMullan, & Kabcenell, 2013). Therefore, to move beyond the common technical focus, QI approaches could be expanded to explore contextual factors, such as those related to the participants in improvement efforts. The Institute for Health Care Improvement

has specifically suggested that new mental models need to be established in order for health care organizations to achieve the Triple Aim (Berwick 1998; Swensen et al. 2013).

1.5.2 Mental models

In all organizations, people hold mental models that influence change processes. Through contributions from cognitive psychology, pedagogy, and organizational science, our understanding of mental models has been expanded to recognize the role of past experiences (Grenier & Dudzinska-Przesmitzki, 2015) and how mental models influence our understanding of a system's purpose, function, and possible futures (Rouse, 1986). Since these representations are "deeply held internal images of how the world works", we are often not consciously aware of them. Yet they impact our behavior and often limit us to "familiar ways of thinking and acting" (Senge, 1990). Therefore, if we do not question and change our metal models, we may limit the possibility for organizations to learn better ways to provide patient care (Berwick 1998). Thus, the theory of mental models is key to understanding change.

The assumption-breaking that is needed for innovation often requires us to become aware of the assumptions and theories we subconsciously have about how we think things work. Often referred to as mental models, the concept was first defined as a "psychological representation of some domain or situation that supports understanding, reasoning, and prediction" (Craik, 1943; Johnson-Laird, 1983). The literature on mental models covers theoretical aspects that have been applied in studies in health care to explain behaviors and ways of thinking and acting. Mental models in health care have been explored in relationship to developing a learning organization (Bohmer & Edmondson, 2001; Carroll & Edmondson, 2002; Hovlid, Bukve, Haug, Aslaksen, & von Plessen, 2012), human resource management practices (Hyde et al., 2013), clinical practice guidelines (Hysong, Teal, Khan, & Haidet, 2012), medical curriculum design (Morcke & Eika, 2009), change agent teams (Hyde et al., 2013), patient safety (Nyström et al., 2012), and public health and contract service policy in public health care systems (Zhou et al., 2015).

An example of a mental model is *"The mental model of learning in health care"*, which is described as largely implicit and widely shared (Bohmer & Edmondson, 2001; Carroll & Edmondson, 2002). The understanding of learning guided by this mental model is that learning is a "relatively structured activity undertaken by individual practitioners as they prepare to enter independent practice and, later, as they maintain and uphold their clinical skills" (Bohmer & Edmondson, 2001). According to this mental model, learning consists of the application of a large body of medical knowledge acquired in a university, complemented with individual practice and repetition of, for example, surgical procedures to obtain certification. This model is in conflict with how organizations learn, where this individualist, monotypic, and linear way of learning is described as problematic, and in contrast to a cyclic, multilevel, and dualistic model that is needed (Bohmer & Edmondson, 2001).

Bohmer and Edmonson (2001) argue that learning in health care organizations must be managed. This is because individuals' mental models are developed through social interactions with others. In organizations, shared mental models develop iteratively in a knowledge creation process "at the group level through dialogue, discussion, experience, sharing, or observation'' (Nonaka & Tekeuchi, 1995). Mental models can be viewed as tacit knowledge. Making this tacit knowledge explicit is crucial to developing shared mental models in an organization (Kim, 1993). Thus, the management of mental models, i.e. the "surfacing, testing, and improving our internal pictures of

how the world works", is a central tenant in the development of learning organizations that are able to adapt to environmental trends, pressures, and demands (Senge, 1990).

In order to become aware of mental models, one can engage in double-loop learning, which involves the process of using reflective loops to identify patterns of thinking and behavior in order to elicit latent assumptions or governing variables. Hovlid and Plessen (2012) describe how staff´s mental models can change through working with clinical care pathways. The staff develop knowledge and a deeper understanding of the clinical system and its interdependencies, which is described as "double loop" learning that is more likely to create sustainable change.

The benefits from surfacing, understanding, and changing mental models in improvement initiatives are not only theoretically tied to the need to become aware of our assumptions in order to facilitate change in general (Swensen et al., 2013). However, which specific mental models actually should be changed has largely been discussed at a conceptual level, without an empirical link to the actual mental models at play in, for example, hospitals today.

1.5.3 Organizational readiness for implementing change

Readiness for change, which is a concept that is often used in the field of implementation science, can be helpful in understanding the context of change at the organizational level. Implementation science is a field of research that studies the gap between evidence and practice. In other words, the core aim of this field is to improve how knowledge, i.e. scientific evidence is translated into practice with the aim of improving effectiveness and quality of care (Braithwaite, Churruca, Long, Ellis, & Herkes, 2018; Damschroder et al., 2009). An organization's readiness for implementing change is considered a paramount "precursor to the successful implementation of complex changes in health care settings (Weiner, 2009).

Weiner (2009) describes two key concepts needed to determine if an organization is ready to implement organizational change: change commitment and change efficacy. These constructs have been widely explored in the field of implementation science in order to identify factors that would improve the implementation of change in health care organizations (Weiner, Amick, & Lee, 2008).

The terminology and conceptualization of Organizational Readiness for Change (ORC) offer little consistency (Attieh et al., 2013; Weiner, Amick, & Lee, 2008). In this thesis, the definition used is that readiness for change comprises "both psychological and structural factors, reflecting the extent to which the organization and its members are inclined to accept, embrace, and adopt a particular plan to purposefully alter the status quo" (Holt, Helfrich, Hall, & Weiner, 2010).

Weiner (2008) describes ORC as both situational and supra-individual, i.e. the organization is its own entity with identifiable patterns of behavior. Weiner and his co-authors propose a conceptual definition of *organizational* readiness for change in psychological terms: The extent to which individuals in the organization are *psychologically* and *behaviorally* ready to implement changes. The psychological aspects of ORC are described as organization members' commitment to change and are defined as a "force (mind-set) that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative" (Meyer, Stanley, Herscovitch, & Topolnytsky, 2002). The behavioral aspects are described as an organization's change efficacy, which refers to members' shared beliefs in their "collective capabilities to organize and execute the courses of action involved in change implementation" (Bandura, 1997). Herscovitch and Meyer

(2002) argue that an organization's members commit to implementing an organizational change for one of three reasons: because they *want to*, *ought to*, or *have to*. Organizational members who commit to change because they "want to" display not only more cooperative behavior (e.g. volunteering for problem-solving teams), but also more championing behavior (e.g. promoting the value of the change to others). Weiner (2009) builds his theory on social cognitive theory (Gist and Mitchell, 1992) and proposes that change efficacy is a function of organization members' cognitive appraisal of the three factors of implementation capability: task demands, resource availability, and situational factors.

Weiner et al. (2008) have reviewed the literature and hypothesize the following theory (Weiner, 2009): an individual's *reasons* for valuing a specific change may be less important than the actual level of organizational commitment to implement those changes. Based on this theory, they developed a brief, theory-based questionnaire, the Organizational Readiness for Implementing Change questionnaire (ORIC). The second component the ORIC questionnaire measures (after commitment) is efficacy, which reflects the degree of knowledge about "what to do" and "how to do it". Perceptions about the resources and time available, task demands, and the current situation that the organization faces all affect this component (Shea, Jacobs, Esserman, Bruce, & Weiner, 2014; Weiner, 2009).

However, the closest the ORIC instrument has come to health care is in its initial testing where it was distributed to pharmaceutical students who were asked to imagine that they were in a health care organization (Shea et al., 2014). There is, therefore, a need to validate the instrument in an actual health care setting, such as a hospital. If the instrument is found valid, then we need to understand the possible implications for quality improvement efforts. After this thesis project was initiated, the instrument was used to explore the readiness for implementing educational and wellness programs (Hannon et al., 2017; Sanders et al., 2017) and for an initiative to improve quality for elder-friendly surgery (Hanson et al., 2017).

1.5.4 Complexity science

Change processes in health care are often chaotic, characterized by unexpected events, discontinuous activities, and shifting goals (Plsek & Greenhalgh, 2001). Complexity science can offer a different view than QI and implementation science regarding the dynamics of organizational change.

The efforts to understand the system, processes, and data as defined by the profound knowledge of improvement have not yet yielded the hoped-for results. One hypothesis is that the type of systems thinking, which underlies the dominant theories for achieving improvements in health care (Batalden & Stoltz, 1993), actually makes successful improvement more difficult since it is characterized by the use of simplistic, linear processes, static models of change, and rationalistic approaches to implementation. Thus, it is unlikely to achieve the large-scale "disruptive innovations" that modern society demands (Sholom Glouberman & Zimmerman, 2002; Greenhalgh et al., 2018).

The dominant scientific paradigm in medicine – the biomedical model of diagnostic reasoning and therapeutic intervention – is challenged by systems and complexity thinking (Sturmberg, Martin, & Katerndahl, 2014). A paradigmatic inconsistency can be recognized, and several authors emphasize that an increased focus on complexity is needed to accommodate future challenges

(Braithwaite et al., 2017; Sholom Glouberman & Zimmerman, 2002; Greenhalgh et al., 2018; Plsek & Greenhalgh, 2001; Sturmberg et al., 2014; Zimmerman, Lindberg, & Plsek, 1998). When organizational change is seen as a complex, non-linear, and unpredictable process, approaches that make space for co-evolution, self-organization, and emergence are better suited to respond to the dynamics that exist at the edge of chaos (A. Best et al., 2012; Booth, Zwar, & Harris, 2013; Braithwaite et al., 2017; Burns, 2001; Institute of Medicine, 2001; Plsek & Greenhalgh, 2001; Zimmerman et al., 1998). Complexity science is not a single theory, but rather a collection of concepts, largely developed in parallel within different scientific fields, i.e. mathematics, meteorology, biology, geology, and the social sciences (Brainard & Hunter, 2016; Sturmberg et al., 2014). Complexity science studies living systems where the actions of individuals impact not only other individuals, but the context as well.

Realizing the numerous parallel scientific explorations made by researchers in their respective fields of similar phenomena, the Sante Fe Institute in New Mexico, USA, united researchers from many different fields in an effort to explore and elucidate commonalities related to complexity science that could then be used to explore and explain emergent behavior in many facets of life, from behavioral economics to cardiac arrest (Waldrop, 1992). One of the first concepts to emerge was Complex Adaptive Systems (CAS). These systems can be defined as follows:

> A collection of individual agents with freedom to act in ways that are not always totally predictable, and whose actions are interconnected so that one agent's actions changes the context for other agents (Plsek and Greenhalgh, 2001).

CAS are characterized by the following elements (Plsek & Greenhalgh, 2001):

1. Having fuzzy, rather than rigid, boundaries
2. That agents' actions are based on internalized rules
3. That the agents and the system are adaptive
4. Systems that are embedded within other systems and co-evolve
5. Tension and paradox are natural phenomena, not necessarily to be resolved
6. Interaction leads to continually emerging, novel behavior
7. Inherent non-linearity, unpredictability and yet often an overall pattern, for example, attractor behavior
8. Inherent self-organization through simple locally applied rules

The systems theories that were popular when Deming first formulated his profound knowledge of improvement promulgated the idea that leaders can drive and direct change remotely as "system designers" (Jarvis, Gulati, McCririck, & Simpson, 2012). Instead, complexity science suggests that change should probably be "managed" or navigated more from inside the organization (Jarvis et al., 2012), and leaders should probably be more immersed in the change process.

As our understanding of complexity thinking and its implications have deepened, we have become aware of some of the basic underlying assumptions we have made along the way. One of these assumptions relates to the idea of systems, which are the result of boundaries that outline and thereby define the system. The realizations that CAS are embedded in other systems and that the interactions and subsequent influences are so difficult to identify and understand have led several researchers to drop the term "systems". More "radical", yet simple, perspectives have emerged, such as that our organizational reality can be understood as the complex responsive processes of

human (inter)relating and that change happens due to the interplay of people's intentions (R. D. Stacey, 2011). This theory of Complex Responsive Processes (CRP) offers an alternative approach to how change can occur in a health care setting (Booth et al., 2013; Mowles, 2010). Stacey (2001) suggests that the interactions between actors lead to change and innovation. By talking about change and what it is to change, the participants in the change process interact with each other through conversations that invite them to review their understandings. Over time, these understandings might change, and these changes will manifest themselves in new ways of working and organizing processes.

> If one takes the perspective that an organization is a pattern of conversation (relational constraints), then an organization changes only insofar as its conversational life (power relations/ideology) evolves. Organizational change is the same thing as change in the patterns of conversations and therefore the patterns of power relations and ideology. Creativity, novelty and innovation are all the emergence of new patterns of conversations, patterns of power relations and ideological themes (R. D. Stacey, 2011, p. 403).

CRP theory have been used both in health care and in the management literature to explore implementation of evidence based medicine in general practice (Booth et al., 2013), leadership and organizational dynamics (Simpson, 2007), leadership development (Jarvis et al., 2012), and change management (Simpson, 2012).

1.5.4.1 Complexity thinking in health care

Complexity thinking has made inroads into health care (Sholom Glouberman & Zimmerman, 2002; Institute of Medicine, 2001; Plsek & Greenhalgh, 2001; Plsek & Wilson, 2001). Interest in complexity science is rapidly increasing as demonstrated by the number of publications in MEDLINE, which over the last two decades has increased from a few publications per year to approximately eighty publications per year (Braithwaite et al., 2017). In the mid-1990s, CAS was first explored in health care management by the Voluntary Hospitals of America (VHA) (Burns, 2001). Since then, complex adaptive systems (CAS) approaches have been suggested as a way to achieve more lasting quality improvements (Ellis, Fhea, & Citp, 2010). And complexity thinking has been used to explain differences in developmental trajectories of health systems due to their ability to adapt to changing contextual forces (Sholom Glouberman & Zimmerman, 2002). In that article, Glouberman and Zimmerman (2002) clarified the distinction between simple and complex with an illustrative description of a *simple* problem (following a recipient to bake a cake), a *complicated* problem (sending a rocket to the moon) and *complex* problems (raising a child). However, the application of complexity science in health care has been questioned (Martin & Félix-Bortolotti, 2010). Is it "the emperor´s new toolkit"? (Reid, 2002) - just another useless fad, that may be both harmful and misleading ? (Martin & Félix-Bortolotti, 2010; Reid, 2002). Recently, a collection of article was published in BMC Medicine under the heading "Understanding complex in Health systems: International Perspectives", with the intention to extend empirical and theoretical knowledge of the application of complexity science in health care (BMC Medicine, 2018). In the opening editorial, the editors of the collection point out that the expected impact of the 2001 series of articles published in *The BMJ* did not lead to the paradigm shift in medical care and medical education they had expected to occur.

1.5.4.2 Developing appropriate responses

Several authors have proposed that if we become better at identifying the different complexity levels of the challenges we face, then we may become better at developing appropriate responses (Sholom Glouberman & Zimmerman, 2002; Greenhalgh et al., 2004, 2017, 2018).

One such approach to linking problems and responses based on the level of complexity is embedded in Heifetz´s theory on Adaptive Leadership (1994). Initially trained as a psychiatrist and now a professor of leadership, Heifetz suggests that situations can be categorized either as *simple* problems that are easy to fixed with technical and already existing solutions; *complicated* problems without clear-cut solutions and which can be addressed with both technical and existing solutions as well as through "adaptive work" that requires learning about how to respond to a situation; or *complex* adaptive challenges where the situation is unclear and difficult to define, and which require learning to develop a response.

According to Heifetz (1994), a simple challenge has a clear problem definition and a clear solution that can be implemented in a top-down manner. Complicated challenges also have a clear problem definition. However, developing a solution requires learning and collaboration between authority and stakeholders. Complex problems require learning to be identified and learning to be used to find solutions. The locus of work primarily lies with the stakeholder, i.e. is driven from the bottom up. (Table 1).

Table 1 Distinction between technical (simple) problem and adaptive (complex) challenges (adapted from Heifetz (2009))

Kind of challenge	Problem definition	Solution	Locus of work
Technical	Clear	Clear	Authority
Technical and Adaptive	Clear	Requires learning	Authority and stakeholders
Adaptive	Requires learning	Requires learning	Stakeholders

As a physician, Heifetz uses the patient-doctor relationship to illustrate the differences, where simple situations often require little effort and readily available solutions, such as antibiotic prescriptions. While at the other end of the spectrum, complex situations, such as addressing chronic conditions, require the development of individualized responses where a large amount of the learning, work, and the onus of responsibility lies with the patient.

The Cynefin framework (Figure 1), is another framework that specifically suggests how leaders can become better able to handle complex situations (Snowden & Boone, 2007). In the Cynefin framework, the categories include five types of context: simple, complicated, complex, chaos, or disorder. Like the Adaptive Leadership approach, the different levels of complexity are described to help leaders understand and adapt their responses.

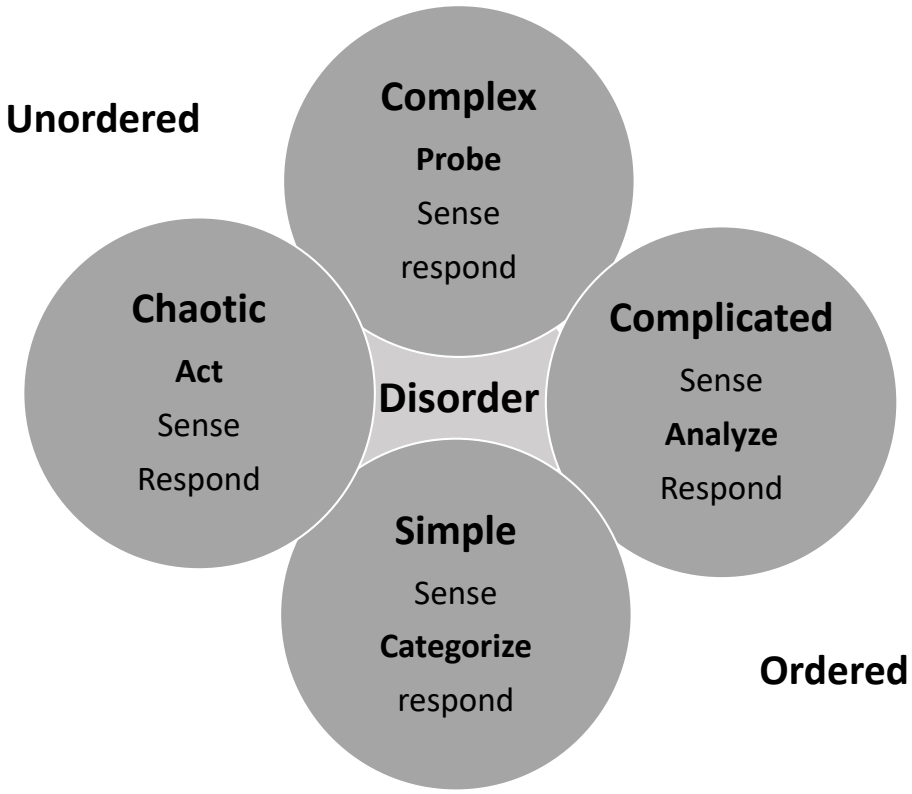

Figure 1 Different types of contextual situations (adapted from (Snowden & Boone, 2007))

What the Cynefin framework adds are the specifications for different decision-making processes at the different complexity levels. The framework suggests that decision processes that match simple situations are sensing, categorizing and responding. In complicated situations, sensing, analyzing and responding are appropriate and for complex situations, use probing, sensing and responding. Chaotic situations require a leader to act, sense and respond. Disorder is the state in which it is unclear if the situation is simple, complicated, complex, or chaotic. This framework has been applied to health care to explore health promotion practices and biomedical research and to better understand the success and failure of quality improvement initiatives – to unpack the black box of improvement (Kempermann, 2017; Ramaswamy et al., 2018; Van Beurden, Kia, Zask, Dietrich, & Rose, 2013)

What the Adaptive Leadership and Cynefin approaches add to the current ways of thinking about complexity in the management of health care are a much-needed element of action. In the two decades since complexity science garnered attention in health care, most applications of complexity science and complexity thinking have been used to categorize and to understand. It is still difficult to grasp the practical implications for the design and evaluation of QI interventions, and more empirical rather than conceptual articles are needed to understand the impact of complexity on QI (Brainard & Hunter, 2016; Braithwaite et al., 2017; Sturmberg et al., 2014; Thompson, Fazio, Kustra, Patrick, & Stanley, 2016).

This thesis attempts to explore how to categorize contextual complexity and to understand how an empirical application can become actionable by developing practical and empirically-based implications for how to innovate quality improvement.

2 RATIONALE, AIM, AND RESEARCH QUESTIONS

The challenge of innovating under financial constraints has been studied in other areas (Mellahi and Wilkinson, 2010), but not in relation to the Triple Aim of health care. To understand this challenge better, mental models related to the Triple Aim need to be empirically examined. In addition, an examination of how staff and managers view the ability and commitment of their organization (e.g. a hospital) to improve and work toward the Triple Aim may provide us with knowledge that can support stakeholders who face downsizing requirements. Complexity thinking, which is a promising lens to examine and understand change in health care, may help us improve our understanding of how innovation can occur when confronted with contextual constraints – how we can innovate from "inside the box". By exploring these gaps in our current knowledge about health care innovation, the intention of this research is to provide insight into how contextual constraints can contribute to health care improvement.

This thesis takes as its starting point the practical problems related to the Triple Aim in health care. The empirical case is an obstetrics and gynecology department at a university hospital that was tasked to decrease the number of beds, to decrease the number of staff, and to reduce its budget while continuing to provide high quality care. The thesis aim is to explore how the (paradoxical) juxtaposition of constraints (such as pairing downsizing with increased quality in patient outcomes and experience) can drive innovations in health care design and delivery.

The specific research questions are:

- How do staff and managers understand the change imperative inherent to the "Triple Aim" and the mental models underlying their understanding? (Study I)

- How reliable and valid is a Danish version of the Organizational Readiness for Implementing Change instrument in a hospital setting? (Study II)

- What is the level of organizational readiness for implementing large-scale change in pursuit of the Triple Aim, and what are the associated key factors? (Study III)

- How do managers in a clinical department address external requirements to reduce costs without compromising patient outcomes and experience? (Study IV)

3 METHODOLOGY

In this chapter, I describe the study design, setting, and the specific methods used in each study.

3.1 STUDY DESIGN

The overall design of this thesis is a single case study (Yin, 2009) of a hospital department which had been asked to downsize while maintaining quality and patient experience. Downsizing, improving quality, and making innovations in the health care setting often involve complex processes (Institute of Medicine, 2001). Multiple components are involved, and improvements can be implemented stepwise or haphazardly in this setting. To study this, therefore, an approach that combines multiple data sources and different methods, such as case studies, can be advantageous.

Case studies focus on developing an understanding of the dynamics at play within a setting (Eisenhardt, 1989). They are a suitable research strategy when:

> (1) the main research questions are "how" and "why" questions, (2) the researcher has little or no control over behavioral events, and (3) the focus of the study is a contemporary (as opposed to entirely historical) phenomenon (Yin, 2009, p. 2).

The method is appropriate when extensive and in-depth descriptions are required to understand complex social phenomena because it allows for a holistic and real-world perspective on, for example, organizational and managerial processes (Yin, 2009, p. 4). The unique strength of case studies is their ability to deal with many different data sources, i.e. a full variety of evidence, such as documents, interviews, and observations (Yin, 2009, p. 12). Moreover, case study design allows for qualitative and quantitative data to be mixed. This enables presumed causal links in real-life intervention to be described and explained when the context is too complex for experimental methods or surveys alone (Yin, 2009, p. 19). This is appropriate when a *critical case* allows for theory or theoretical propositions to be tested (Yin, 2009, p. 51).

Many health care organizations wrestle with efficiency requirements or efforts to achieve the Triple Aim. What made this case worthy of further, in-depth study was that the efficiency requirements were unusually large, involved a high degree of interaction and coordination, and had a requirement to improve and innovate. Thus, this single case can be seen as an *extreme* or *unusual* situation that offers an opportunity worth documenting and analyzing, i.e. it is a critical case (Yin, 2009). The case represented an opportunity for an observational study of a natural experiment in which the researcher had no control over the change strategies or processes that were studied. However, the researcher was a member of the staff and was granted full access. The former improves the opportunity for a *longitudinal* perspective to be captured and an in-depth analysis to be conducted (Yin, 2009, p. 53). The latter is crucial in organizational research (Gummesson, 2000).

The thesis is comprised of four empirical studies using qualitative and quantitative data, which together help provide an in-depth understanding of the dynamics at play within the single case. In Study I, I explore the mental models of organizational members (staff and managers) that underlie their understandings of the change imperative inherent to the Triple Aim. In Studies II and III, I validate a Danish version of the Organizational Readiness for Implementing Change (ORIC) questionnaire, assess organizational readiness for implementing large-scale change in pursuit of the Triple Aim, and determine associated key factors. In Study IV, I use a combination of two

complexity-based leadership frameworks to explain how managers in a clinical department addressed external requirements without compromising patient outcomes and experience.

3.2 STUDY SETTING

The study was conducted at the Department of Obstetrics and Gynecology (OB/GYN) at the Aarhus University Hospital (AUH) in Aarhus, Denmark.

3.2.1 The Danish health care context

In Denmark, the health care system is decentralized, publicly funded, and serves 5.6 million inhabitants. The structure of the system, which is similar to that of the other Nordic countries and the United Kingdom (Rudkjøbing et al., 2012), currently includes the State, five regions, and 98 municipalities. The State oversees the legal frameworks and overall financing and monitors and evaluates the services provided. The municipalities and regions are responsible for delivering public services at increasing levels of specialization (Christiansen, 2012; Rudkjøbing et al., 2012). The State increasingly takes responsibility for the distribution of specialist care among primary, secondary, and tertiary units, and monitors care quality and efficiency (Rudkjøbing et al., 2012). As part of this process, a major structural reform took place in 2007 (Finansministeriet, 2007).

This reform centralizes Danish health care services in an effort to improve integration and coordination of care (Finansministeriet, 2007; Rudkjøbing et al., 2012). To guide the redesign of the hospital structure, the Danish Government followed the recommendations of a Scandinavian expert group that estimated that a new hospital structure could improve efficiency. The expert group predicted that outpatient treatment would increase by 50%, while the number of hospital beds could be reduced by 20% between 2007 and 2020 (Christiansen, 2012). Thus, the proposal for a new structure involved the merger of hospitals, reconstruction of existing hospitals, and the construction of new hospitals designed for better capacity utilization (Christiansen, 2012; Danske Regioner, 2012). One of the cornerstones in the reform was the establishment of sixteen new "super hospitals" of which Aarhus University Hospital (AUH) is one. The improved capacity utilization was estimated at 8% (Regeringens ekspertpanel vedr. sygehusinvesteringer, 2008), and consequently the financing of the new hospitals stipulated an 8% efficiency requirement.

3.2.2 Aarhus University Hospital

During the study period, and as a result of the national health reform, AUH underwent a hospital merger, downsizing of beds, and the construction of a new hospital.

AUH is a publicly funded and owned university hospital. It serves as a general hospital for the 400,000 inhabitants within the (former) Aarhus County and as a highly specialized care provider for the 1.2 million inhabitants of Region Midt, Denmark. In 2014, the hospital had 10,000 employees, 993 beds, and an annual operating budget of DKK 6.5 billion (870 million €). Spread across four sites, AUH was tasked by the Danish Government and Central Denmark Region to consolidate into one location and to build a new "AUH under one roof" within a budget of 6.3 billon DDK (840 million €). Financing for AUH was calculated on the projected efficiency gains of 8% (Ministeriet for Sundhed og Forebyggelse Slotsholmsgade 10-12 1216 København K., 2008). The re-organization and consolidation commenced in October 2009, with a planned completion date in 2019. The administrative merger was completed in April 2011.

AUH Hospital management required each hospital department to reduce bed capacity and staff (and thereby costs) and to maintain clinical quality and production. This exemplifies the practical real-world challenge of striving towards the Triple Aim, where cost aspects are often more clearly defined than the quality aspects (outcomes and experience).

3.2.3 The Department of Obstetrics and Gynecology

The specific requirements from hospital management for how much each department should downsize were based on demographic calculations and the desire to reduce floor space (and thereby costs). The Department of Obstetrics and Gynecology was asked to reduce its budget by 10% through a reduction in beds of 36% and a reduction in nursing staff of 20%.

When the efficiency requirements were first introduced, the Department of Obstetrics and Gynecology had 70 beds, 8550 yearly admissions, and 90.000 out-patient visits (2013). The median Length of Stay (LOS) in the department was 73 hours. The department had approximately 400 employees and was headed by three department managers, each with a clinical background as a physician, midwife, or nurse, respectively. Only the head physician was still clinically active.

The improvement efforts were overall deemed as successful in relation to the Triple Aim. By 2014, the department had managed to successfully reduce the number of beds as planned. Between 2013 and 2016, the budget showed savings of 15.37 million DDK (8.6%) based on data provided by the hospital administration. LOS was reduced by 24% from 73 hours (in 2013) to 53 hours (data retrieved from internal improvement reports) and readmissions in the department did not increase, although a 28% increase was observed after in-patient gynecological surgery. These patients were only a smaller proportion of all admission to the department; thus, this increase did not affect the overall level of readmissions. Data from the national clinical quality databases showed stable results in quality. No significant changes in the yearly patient reported outcomes measures (PROM) was seen after 2014, according to the national statistics.

3.2.4 The change process

To address the efficiency requirements, the department management initiated a planning process in April 2013. In the next month, management developed a masterplan together with first-line managers and the department staff committee. The plan was presented in a plenary meeting in August 2014. In the following month, interdisciplinary working groups were appointed and mandates for their further work in the groups were developed. At the same time, it was made explicit that the reduction of staff should be made among nurses as stipulated by the hospital management. The working groups were formed within both the obstetric and gynecological sections to develop suggestions for how to optimize care processes that could be implemented to meet the downsizing requirements.

In October 2013, the first obstetrical camp was held to process map selected clinical pathways for inpatients (pregnancy ward, labor ward, and maternity ward). The managers chose a lean-inspired approach, which has been used widely in health care (Mazzocato et al., 2010). Their ambition, as they explained to staff, was to engage staff in the design of more efficient clinical pathways for patients and thereby to reduce the length of stay and the number of admissions to the department. Making clinical care more efficient and looking at ways to shift to more outpatient care could allow the department to reduce the number of beds and of nursing staff. The same approach was used in a revision of the gynecological inpatients. This camp was held in February 2014. The chairs

appointed to lead the groups received training in process mapping by a regional lean-facilitator before the camp. The overall workshop facilitation and project management were handled by the department managers, without additional support from external consultants. There was no support from the hospital administration.

Over a period of nine months (Feb-Oct) in 2014, 21 of 70 beds were closed. Two more beds closed in January 2017. The last two beds are planned to close in 2018 when the new AUH emergency department will open. Forty nursing staff voluntarily retired or left the department between July 2013 and October 2014 for other positions. Changes in clinical pathways and the organizational structure were successfully implemented in the obstetrical section beginning in July 2014 through February 2017.

During the change process, I participated as an observer in the camps and most other meetings held by the department managers intended to develop innovative solutions. In the camps and meetings, I asked questions while taking field notes. However, I was not an active participant in the group-work discussions or in the process mapping activities. Immediately after the camps and key-meetings, I prepared an overall thematic analysis of my field notes and shared my observations and reflections with the department managers. This was done during and after the camps and key follow-up meetings. I also participated in discussions about the process-facilitation. I continuously reflected on my own role and discussed this with the department managers and my supervisors.

3.3 DATA COLLECTION AND ANALYSIS

Data was collected from October 2013 to January 2018. An overview of the study design and methods for data collection and an analysis for each of the four studies are presented in Table 2.

Table 2 Data collection and analysis

Study	Aim	Study Design	Time period covered	Data collection	Analysis
I MENTAL MODELS AND TRIPLE AIM	To explore how staff and managers understand the change imperative inherent to the Triple Aim and the mental models underlying their understanding	Qualitative interview study	June 2014-November 2014	30 semi-structured interviews (12 managers + 18 randomly selected staff)	Content analysis; Graphical elicitation of mental models; Modified analytic induction
II ORGANIZATIONAL READINESS FOR CHANGE	To assess the reliability and validity of a Danish version of the ORIC instrument in a hospital setting	Survey study	June 2014-November 2014	Organizational Readiness for Implementing Change – Questionnaire	Exploratory and confirmatory factor analysis; Rasch analysis; Regression analysis
III ORGANIZATIONAL READINESS FOR CHANGE	To assess organizational readiness for implementing large-scale change in pursuit of the Triple Aim and determine associated key factors	Survey study	June 2014-November 2014	Organizational Readiness for Implementing Change – Questionnaire	Descriptive statistics and multiple linear regression
IV COMPEXITY AND THE TRIPLE AIM	To explore how managers in a clinical department address external requirements to reduce costs without compromising patient outcomes and experience?	Explanatory case study using a complexity-based leadership framework (theory informed) single case study	Ocober. 2013-January 2017	198 documents + >250 hours of observations + 30 semi-structured interviews (same as in study I)	Content analysis; Theory driven analysis;

3.3.1 Study I

Study I use a qualitative study design based on semi-structured interviews. Interviews are commonly used to study mental models (Grenier & Dudzinska-Przesmitzki, 2015). Thirty respondents were interviewed.

The interview guide included open-ended questions about interviewees' understanding of the purpose, objectives, content, and outcomes of the organizational changes. All managers and a randomly selected group of staff were included. Throughout the interviews, we explored in-depth different juxtapositions of the three aspects of the Triple Aim. Interviews were conducted between June and October 2014, in a quiet room at the department except for two interviews conducted via Skype. Each interview lasted about an hour and was digitally recorded (see the interview guide in Appendix I).

As the number of employees was large, we randomly selected participants from purposively chosen personnel categories. Eighteen staff members were selected from among the different staff categories. We included physicians from each section of the department and residents to balance the greater number of nurses and midwives among the managers. Twelve managers were chosen. All had health care backgrounds and were involved in the downsizing efforts. They were the three department heads (physician [clinically active], nurse, and midwife) and nine middle managers (nurses and midwives).

The interviews were analyzed using inductive content analysis (Graneheim & Lundman, 2004) with NVivo qualitative data analysis software (QSR International Pty Ltd. Version 10, 2012) to organize, code, and categorize the data. To articulate the mental models, we reviewed interviewees' statements related to the Triple Aim and tried to elucidate what their understanding "was really about". In an approach analogous to root-cause analysis, we repeated the question, "Why do they think like this?" until we could identify a robust answer. We employed a graphical elicitation approach (Grenier & Dudzinska-Przesmitzki, 2015). We mapped potential second-order themes with a concept map. Then we identified patterns among the themes through drawing. Inspired by modified analytic induction (Bergin & Savage, 2011), we then went through all the codes again to test each mental model and looked for examples that could disprove it.

3.3.2 Studies II and III

Studies II and III were cross-sectional survey studies. The survey instrument was a translated 12-item version of the English Organizational Readiness for Implementing Change (ORIC) instrument (Shea et al., 2014), presented in Table 3. The survey was distributed to all department employees (staff and managers) in June 2014 (n=403), just prior to the implementation of the first changes in clinical pathways.

Table 3 The original version of the ORIC (12 items) as presented in (Shea et al., 2014)

Item Number	Item Description
Change Efficacy (7 items)	
E1	People who work here feel confident that the organization can get people invested in implementing this change
E2	People who work here feel confident that they can keep track of progress in implementing this change
E3	People who work here feel confident that the organization can support people as they adjust to this change
E4	People who work here feel confident that they can keep the momentum going in implementing this change
E5	People who work here feel confident that they can handle the challenges that might arise in implementing this change.
E6	People who work here feel confident that they can coordinate tasks so that implementation goes smoothly
E7	People who work here feel confident that they can manage the politics of implementing this change
Change Commitment (5 items)	
C1	People who work here are committed to implementing this change.
C2	People who work here will do whatever it takes to implement this change
C3	People who work here want to implement this change
C4	People who work here are determined to implement this change
C5	People who work here are motivated to implement this change

Staff and managers were asked to rate their level of agreement with items measuring efficacy and commitment using a 5-point Likert scale (1=strongly disagree and 5=strongly agree). A low commitment-score indicates that organizational members have some resistance to the expected change. The efficacy-score reflects how well they perceive the organization supports the change.

Statistical analysis was conducted to assess the reliability and validity of the Danish translation of the ORIC survey. The reliability of the instrument was examined with Chronbach´s alpha. To investigate construct validity, factor analysis was conducted. Exploratory factor analysis (EFA) using principal axis factor analysis to evaluate dimensionality was followed by confirmatory factor analysis (CFA) (Study II). In Study III, statistical analysis was conducted to assess the organizational readiness for implementing large-scale change in pursuit of the Triple Aim, and to determine key associated factors. Descriptive statistics were used to assess overall organizational readiness and single items. The between-group differences in subject characteristics were assessed with an independent *t*-test for continuous variables and a non-parametric test for ordinal variables. Multiple linear regression was employed to control for potential confounders. Statistical significance was set at 0.05.

3.3.3 Study IV

Study IV followed a single case study design and used an explanatory approach (Yin, 2009, p. 30). In this study, two complexity-based leadership frameworks were combined and used to explain

how managers in a clinical department addressed the external requirement to cut costs without compromising patient outcomes and experiences. Documents, interviews (the thirty interviews from Study I plus a follow-up interview and informal conversations with the physician department head), observations, and hospital administrative data were collected between October 2013 and January 2017. The participatory observations were conducted in workshops, planning meetings, plenary meetings, local staff meetings, and physician morning meetings (n=134 meetings, ca. 285 hours) that department management attended (Table 4).

Table 4 Overview of observations

	Number of observations	**Hours of observation**
Workshops/Seminars	9	100
Meeting (planning, plenary, local staff, physician morning and physician specialist)	134	185

Observations focused on understanding the content, context, and process of change, specifically by capturing the conversations between staff and department managers in the meetings. Personal reflections and impressions were noted, and key observations were discussed with the physician department manager in follow-up meetings. Participation occurred mainly in the form of questions asked during observations and in discussions with the department managers.

For the analysis, documents (n=198) that included working documents, process maps, power point presentations, meeting minutes, action plans, hospital reports, and department newsletters were organized chronologically in NVivo together with field notes (n=13) from key workshops and planning meetings. This created a case study database (Yin, 2009, pp. 124–125). Data were coded thematically into different pathways and changes to the organizational structure. The follow-up interview with the physician department manager was used to determine which changes were actually implemented. The interviews from Study 1 were used to develop a timeline for the case description and to triangulate with the other data sources to develop a thick case description and to create abstracted descriptions of the implemented changes at the level of individual pathways and at the organizational level.

To further explain how managers addressed the external efficiency requirements, we developed a Complexity Analysis Framework that combined two prescriptive frameworks: “Adaptive leadership” and the “Cynefin framework” (R.A. Heifetz, 1994; Snowden & Boone, 2007). The Adaptive leadership framework prescribes that problems and challenges can be categorized as technical, technical and adaptive, or adaptive. However, these elements are often intertwined. Problems are either clear or challenges that require learning to diagnose. Solutions are clear, and responses require learning to develop. The locus of responsibility lies with the manager and/or with the staff. The Cynefin framework adds different decision-making processes that fit the different types of challenges. Combined, the frameworks allow us to categorize complexity in terms of the problem definition, responses, the locus of responsibility, the kind of work needed, and the decision-making processes (Table 5). We used the framework to identify overall patterns that could be captured in the data.

Table 5 The Complexity Analysis Framework for Quality Improvement Efforts in Health Care

Situation	Problem definition	Response	Primary locus of responsibility for the work	Kind of work	Decision-making process
Type I. Simple	**Clear** Ordered universe with clear causality.	**Clear** Answers are self-evident, undisputed, and can be determined based on facts and evidence.	Manager	**Technical** Often a question of solution implementation	Sense **Categorize** Respond
Type II. Complicated	**Clear** Ordered universe with clear causality, though not perceived by everyone.	**Requires learning** May contain multiple correct answers. Involves analysis, expert consultations, and the creation of working groups. Requires coordination and collaboration. It is time consuming, and often requires a tradeoff between finding the "best" answer and making a decision, but complete data becomes available, eventually.	Manager and staff	**Technical and adaptive** Often a question of solution implementation and evolution of new responses through experimentation and discovery	Sense **Analyze** Respond
Type III. Complex	**Requires learning** Unordered universe with no clear causality.	**Requires learning** No right answers exist. Decisions often based on incomplete data.	Staff > manager	**Adaptive** Often a question of evolution of new responses through experimentation and discovery	**Probe** Sense Respond
Type IV. Chaotic	**Requires action** to create stability in an unordered universe.	**Requires action** to stabilize in order to gain perspective and enable diagnosis. No point to search for right answers.	Manager	**Technical**	**Act** Sense Respond

3.3.4 Explanation development

In order to develop explanations for the patterns that can be observed in case studies, triangulation – the combination of different sources to understand a phenomenon – is a standard methodological approach. The triangulation of data, theory, and methods in the thesis (Yin, 2009, pp. 120–121) was used as an overall strategy to develop explanations for how the observed changes in the clinical pathways and in the organizational structure related to staff and managers' mental models, managerial change strategies, and costs. This is presented in the discussion.

Triangulation was used among the findings from Studies I, III, and IV to construct trustworthy and generalizable explanations about how contextual constraints can contribute to improvement in health care. Relevant change management theories and frameworks were used to provide perspectives on the empirical patterns that were identified.

3.4 ETHICAL CONSIDERATIONS

Because none of the studies in this thesis used patient sensitive data, the Central Denmark Region ethical vetting board deemed an ethical vetting of the research was unnecessary. Coming to this conclusion involved providing details of the project to the committee so that this decision could be made. All the same, considerable efforts were made to consider the different ethical aspects, which are summarized in the methodological considerations section of the discussion.

Respondents were informed about the purpose of the interviews and that they could withdraw their participation at any point. Oral informed consent was sought and received from all interviewees, interview data were anonymized in the analysis, and transcripts were kept in a password-protected computer. At the commencement of this thesis project, the project and my role as a researcher, including data collection through observations, were explained at all the meetings I attended. It was explained that the data collected would be analyzed and reported anonymously. This included the quantitative data from clinical quality databases and hospital administrative systems that were collected and analyzed without access to names or personal identification numbers.

4 MAIN FINDINGS

First, a description of the case is presented after which the findings from the different studies are reviewed in terms of the mental models associated with the Triple Aim, organizational readiness for implementing change, and finally the interaction between content, process, and context.

4.1 CASE DESCRIPTION

The Danish Health Care Reform led to an external efficiency requirement for the department. This requirement triggered an extensive change process. Department managers quickly understood that the efficiency demand was beyond the usual cost reduction scenario. Using a "professional path" strategy, they translated the downsizing requirement into a large quality improvement project. The aim was to improve patient experience and outcomes within the constraints of reduced floor space and staff.

The first beds were closed in February 2014 following an eleven-month planning period. The planning resulted in a "master plan" that was developed together with first-line managers and the department staff committee. In the plan, core principles, aspirations, and the foundational prerequisites of the department were outlined (Figure 2) together with what was referred to as the "Professional Path" strategy. The plan was presented, discussed, and accepted by the staff and managers in both the obstetrics and gynecology sections as the way to proceed.

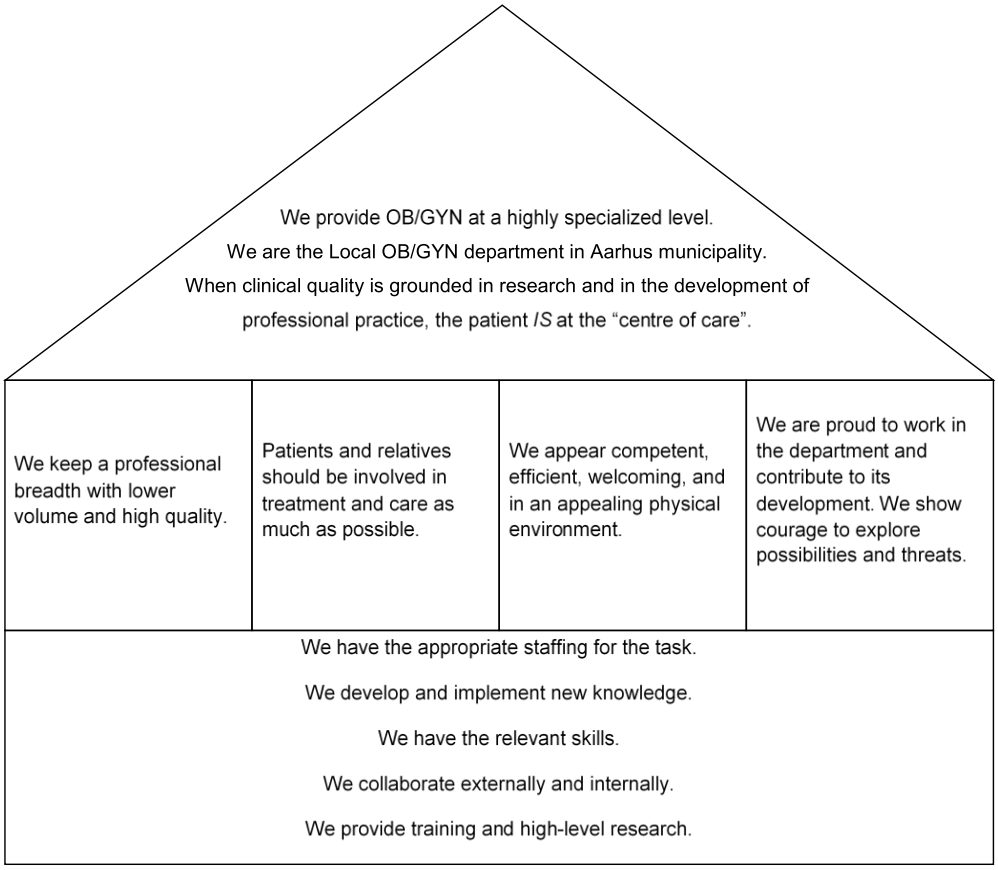

Figure 2 The aspirations, principles, and foundational prerequisites (in descending order) of the department

To identify ideas for better and more efficient care, interdisciplinary working groups were appointed and given a mandate to review clinical pathways. They used Lean methodology and process mapping in off-site kick-off camps developed to shield working groups from external disturbances. The purpose of these camps was to create a sense of "being on a mission" that was meaningful and challenging and that required cooperation. This approach was inspired by literature on creativity, especially Amabile´s (2002) article "Creativity Under the Gun". Supported by the department managers, the working groups mapped inpatient pathways by asking question based on the following four principles described in the masterplan.

1. Patients prefer to be at home
2. Coordination and collaboration within each pathway and across organizational boundaries can be improved
3. Hospital- based care should be reserved for those patients with serious conditions or a need for highly specialized care
4. Functions should be combined across organizational boundaries and competencies utilized across teams.

They asked: "What do we do that works well?", "What is problematic?", and "Which ideas do we have to address?" The managers encouraged participants to ask questions that challenged old habits and assumptions about good care. For example, "Is this really needed?", "What do our patients prefer?", and "Is there evidence for this?"

Five more off-site obstetrical camps were facilitated by department managers. In contrast, the gynecology section held shorter, manager-led, on-site meetings and workshops (Figure 3).

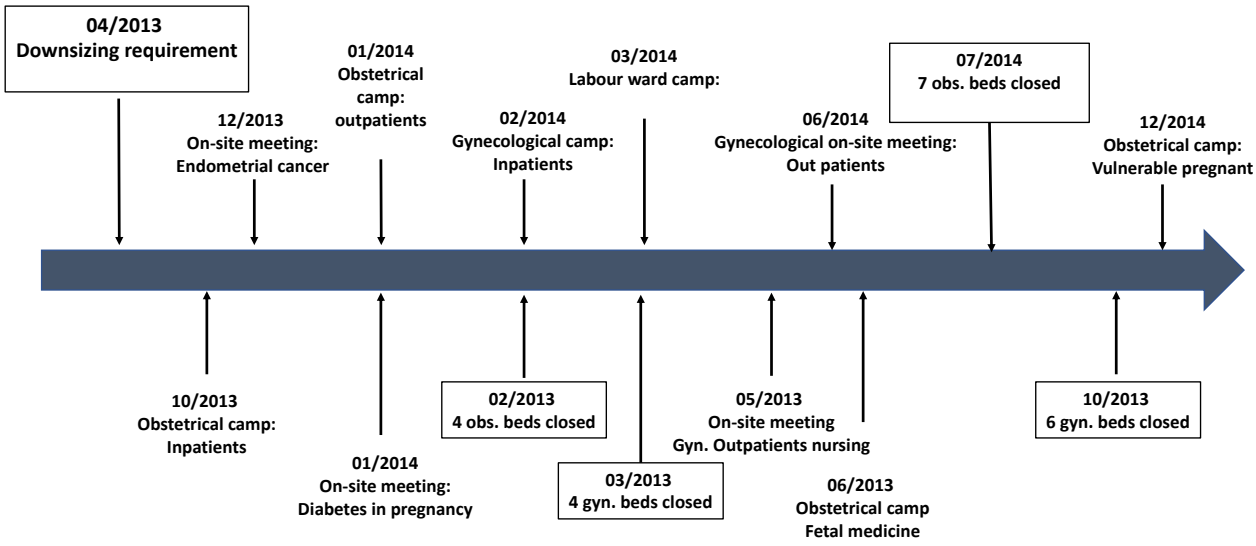

Figure 3 Timeline with 5 obstetrical camps, 1 gynecological camp and on-site meetings

The outcomes of the camps and workshops were followed by an iterative, back-and-forth process between working groups and the department managers who prioritized which ideas should be developed and explored further. Design thinking methods and rapid prototyping were recommended as useful tools in the follow-up phase. Throughout, the ideas developed were posted on

bulletin boards and presented at staff meetings and at regular plenary meetings. A newsletter was distributed weekly, and a blog and videos from the camps were added to the internal webpage.

Thirty-seven care pathways for individual medical conditions were changed (27 OB and 10 GYN), seven other changes influenced multiple pathways (1 OB and 6 GYN), and nine overall organizational changes were made (4 OB, 4 GYN and 1 for both OB and GYN) (see Appendix 2). The organizational changes addressed referral practice, the physical space in the department, flow and capacity, discharge speed, and managerial support (Table 6).

Table 6 Content of the organizational changes in the department

Organizational Situation	Changes in Obstetrics	Changes in Gynecology
Referral (external and internal) and flow into department	1. Expanded function of nurse coordinator in Obstetrical Outpatient Clinic 2. Establish a coordinator midwife function in the Midwife Clinic 3. Partus telephone	1. Establish a regional central referral unit 2. Establishing extra ambulatories for cancer bundle patients 3. Regional agreement that emergency patient can be referred to other hospital in case of a full department
Changes in physical space	1. Establish new obstetrical settings with 4 units (After Birth Clinic, Emergency Obstetrical Clinic, Pregnancy Ward and Labor-ward) in the same physical space.	1. Establish a new gynecological ambulatory with all sub-specialties in the same physical space – and available anesthesiology support. 2. Establish secretary teams located in ambulatory settings
Flow and capacity	1. Changed staffing, task shifting and more collaboration among nurses and midwifes	1. Changed physician staffing in nightshift, which increased the amount of specialist during the day shifts. 2. Changed working hours for a nurse 3. Increased surgical capacity, more robotic surgery, more surgical OR-lines and training of surgeons. 4. Establish a weekly planning meeting to ensure optimal use of ambulatories and operating theater. 5. Establish a coordinator nurse function for cancer bundles in the ambulatory
Faster discharge after admission	1. Establish a “walking nurse” function to care for patient in Patient Hotel and After Birth Clinic 2. Formalized agreements with other department and municipality about transfer of patients. 3. Establishing an After-birth Clinic with a 24/7 access telephone hotline to handle patient that was discharged faster. 4. Establish “home-team” for vulnerable families 5. Establish a culture that facilitates discharge 24/7	1. Formalized agreements with other department and municipality about transfer of patients 2. New ward round routines to ensure smooth discharge 3. Establish a physician (General Practitioner-resident) support function to do ward round. 4. Establish a culture that facilitates discharge 24/7 5. Weekly palliation conference
Managerial support	1. Employ a Quality and Safety nurse in the department to support management (OB & GYN)	

Between February and October 2014, beds were closed as planned. Two more beds were closed in January 2017. The remaining two beds will be relocated to the emergency department in 2018. Implementation of changes in the clinical pathways began in June 2014 and carried on over years, for example was the test for Group B Streptococcal (GBS) infection not fully implemented before March 2017.

4.2 MENTAL MODELS ASSOCIATED WITH THE TRIPLE AIM (STUDY I)

Four mental models were identified among staff and managers related to two themes: Change in health care and economics in health care (Figure 4).

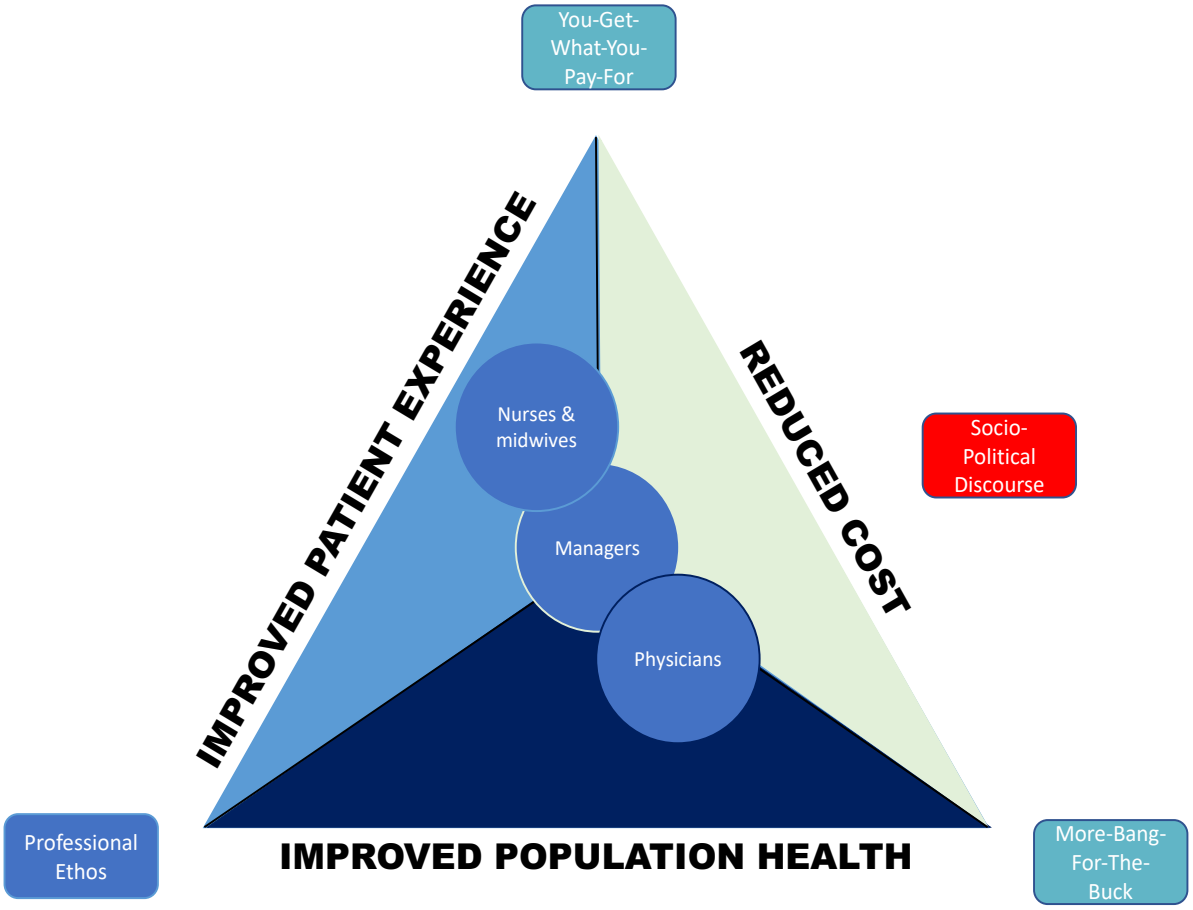

Figure 4 Mental models related to different aspects of the Triple Aim

- **Professional Ethos: Change is driven by professionals' desire to improve clinical outcomes and the care experience of patients. The different professions emphasized different dimensions of the Triple Aim.**
- **Socio-Political Discourse: Change is driven by the social and political discourse – which currently is cost reduction**
- **You-Get-What-You-Pay-For: Lower cost will lead to lower service (experiences) and lower quality**
- **More-Bang-For-The-Buck: Cost constraints can contribute to improving care**

4.2.1.1 Mental models of change

Two mental models of change were found to underlie how staff and managers understood the efficiency requirement: The *Professional Ethos (C1)* and the *Socio-Political Discourse (C2)*.

The *Professional Ethos* (C1) mental model underlay the dominant understanding that "change in health care is driven by professionals' desire to improve clinical outcomes and/or get rid of old habits". In this mental model, change is the result of advances in research, application of evidence-based medicine, and advances in medical technology. Moreover, improvement is led and driven by clinicians who critically review clinical practice. From this perspective, it is not relevant to consider the financial aspects of care. Cost-saving rounds were not seen as a way to improve health care. Thus, this model is positioned in the corner of the Triple Aim triangle, where patient experience and population health meet (Figure 4). This mental model was shared widely among the interviewees. However, the emphasis was on different aspects of the Triple Aim depending on their profession. Nurses and midwives focused on the patient experience, in particular the idea that patients should feel "seen and heard" as individuals. Physicians focused on measurable clinical outcomes, such as the number of complications that followed surgical procedures or morbidity and mortality related to pregnancy and birth (circles within the Triple Aim triangle in Figure 4).

The *Socio-Political Discourse (C2)* mental model underlay the understanding that *change in health care is driven by the social and political discourse.* External pressure related to the dominant societal discourse has pushed health care to become more efficient and to reduce costs. Politicians, who set the agenda, force health care managers to implement initiatives that reduce costs. This is a bitter necessity. However, in the larger perspective, creating more value for money was perceived as fair, albeit misaligned with the core values of health care. The societal agenda was perceived as potentially detrimental to the humanistic values of care. Moreover, political decisions were often considered unrealistic, lacking in contextual understanding, and mainly financially motived. Thus, this model is positioned at the cost side of the Triple Aim triangle (Figure 5).

4.2.1.2 Mental model of economics

Two mental models underlay how staff and managers understood economics in health care: the *You-Get-What-You-Pay-For (E1)* and the *More-Bang-For-The-Buck* models *(E2).* The *You-Get-What-You-Pay-For (E1)* mental model underlay the understanding that *there is a direct relationship between lower cost and lower quality.* This model, which was clearly evident among staff, can best be captured with a grocery shopping metaphor: If you have less money, you can only purchase goods or services of lower quality, like a hot dog, not a steak. Directly translated into health care, this understanding means that cost reductions will have negative consequences for patients and staff. Thus, this model is positioned in the corner of the Triple Aim triangle, where cost and patient experience meet (Figure 5). The vulnerable and frail patients suffer because the focus increasingly provides care for the most ill patients – compromising the safety of "uncomplicated" patients. In addition, research, engagement in national organizations, and continuing education were perceived to be threatened by cost reductions. Similar concerns were voiced by managers who worried that they had to lower their ambitions for the level of care provided. They indicated that politicians seemed reluctant to make the needed tough choices that prioritized care.

The *More-Bang-For-The-Buck (E2)* mental model underlay the understanding that *cost constraints can contribute to improving care.* This model is positioned in the corner of the Triple Aim triangle, where cost and the population's health meet (Figure 4). The managers especially said that something "good" had come from previous cost saving rounds. They hoped and believed that this would again be the case. They saw opportunities to improve patient satisfaction, bridge teamwork, and improve care and efficiency. Yet they also tried not to become too efficient because such efficiency could compromise their ability to draw from the "efficiency buffer" in the (inevitable) future cost savings rounds.

4.2.1.3 Mental models mediated change strategies

A complex interplay between these four mental models was identified, which guided staff and managers' actions as the faced the Triple Aim. A juxtaposition of the external requirement to become more efficient (C2) and the professional desire (C1) to improve care was described. The models existed simultaneously in the department and, at times, within the same individual. The managers, who were concerned with the external downsizing requirement, worried that staff would be demotivated. They described how they translated the political pressure transmitted from the hospital management to a focus on improving clinical pathways and putting the "patient first". This approach was described as taking the "professional path" in which the focus was on improving care for patients rather than just reducing costs. The underlying assumption behind this strategy was that the cost constraints could be turned into improved care for patients (E2).

The managers emphasized the importance of paying attention to staff concerns and not just to optimization and efficiency. They explained that they expected interdisciplinary involvement would motivate staff to change. Furthermore, they expected a positive effect on the department because staff would become aware of the already existing interdependencies between wards, sections, and disciplines. The managers expected that better collaboration across organizational and professional boundaries would result from working together on improving care pathways. The extensive analysis of all departmental care pathways was described as a way to placate both staff and hospital management – it allowed department managers to resonate with the intrinsic motivation of staff (C1) and to respond to upper managerial pressure (C2). The systematic review of clinical care pathways was expected to create a "safety net". In the case of a failure to achieve the financial goals, managers could argue that it was impossible, as they had "turned over every stone in the department" and had not succeeded.

Another result of the interaction of models (E1 and C1) was frustration and anxiety. A sense of resignation and a feeling of being "forced to change" were the responses from some staff members. They felt forced to make compromises. The grocery shopping metaphor (E1) caused staff to doubt the effectiveness of the planned changes and the managers to state that they would accept lower levels of service as long a patient could be cared for safely and clinical quality was maintained. This also characterized their description of meetings with upper management, where this reasoning dominated, as they emphasized that clinical quality and the care experience could be jeopardized. The acceptance of aiming for the lowest acceptable level of quality negatively affected staff motivation. In contrast, when the assumption of *More-Bang-For-The-Buck* was combined with the *Professional Ethos*, the interaction resulted in the development of the

professional path strategy. Thus, the understanding of the Triple Aim was influenced by which mental models were activated, by whom, and under which circumstances. The different combinations could either result in concerns over compromises in care quality or experience or in ways to improve care.

4.3 ORGANIZATIONAL READINESS FOR IMPLEMENTING CHANGES TO BECOME MORE EFFICIENT (STUDIES II AND III)

When the English version of ORIC was translated, an 11-item, 2-factor model (commitment and efficacy) was found to be both valid (CFI=.95, RMSEA= .067 and CMNI/DF=2.32) and reliable (Cronbach´s alpha 0.88) for a Danish speaking population. The response rate was 72%. The descriptive analysis of the ORIC measurement showed that overall, the organizational readiness for implementing change had a median of 39 (35, 45) on the overall total ORIC scale (11-55), with a median change commitment score of 19 (16, 21) on the change commitment scale (5-25), and a median change efficacy score of 21 (17, 24) on the change efficacy scale (6-30).

A majority (56%-88%) of the respondents agreed (agree + strongly agree) with the change commitment statements (C1-C5). For change efficacy (E2-E7), this proportion was lower, ranging from 24% to 43% agreement (Figure 5). Eighty-eight percent of organizational members agreed with the change commitment questions regarding "committed to implementing this change" (C1). They agreed the least (56%) with "motivated to implement change" (C5). Compared to commitment, all efficacy questions were rated lower. The respondents agreed most (43%) with "feeling confident that they could handle the challenges that might arise in implementing change" (E6) and least (24%) with "that they could keep track of progress in implementing this change" (E2).

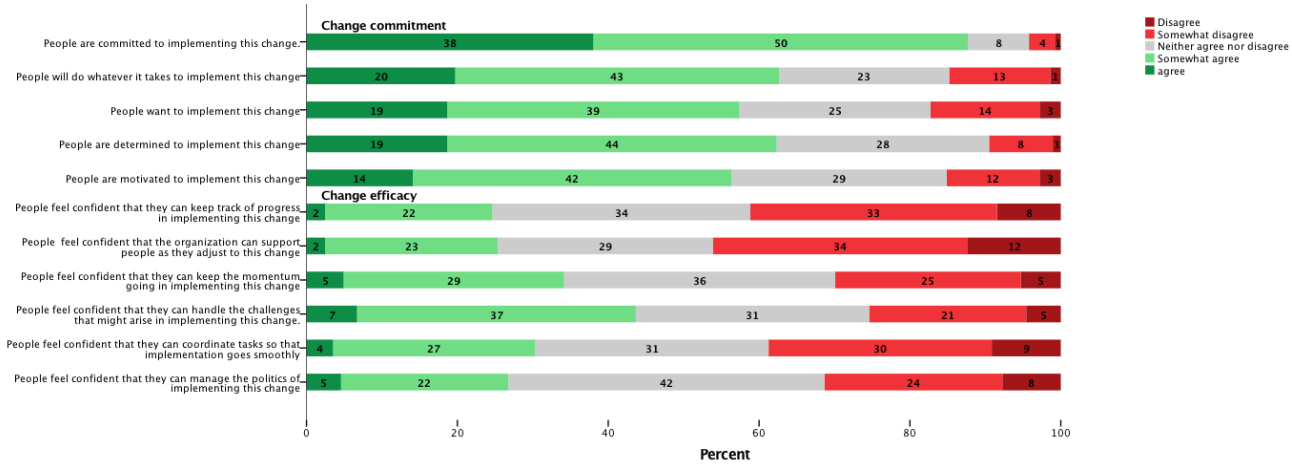

Figure 5 Proportion of response categories by item for Organizational Readiness for Implementing Change related to adapting and restructuring the OB/GYN department in pursuit of the Triple Aim" (n=284)

There were no significant differences in the total ORIC score between the gynecological or obstetrical sections, neither in relation to gender, age, or professions in descriptive and bivariate analysis, nor in linear multiple regression analysis. Managers (n=15) perceived the organization's readiness for implementing change significantly higher than staff did. Also, temporarily employed staff (n=23) had a higher total ORIC score. The significant difference between staff

and managers was determined by the total efficacy score; in other words, managers and temporarily employed staff were more behaviorally ready to change and perceived organizational knowledge available about "what to do" and "how to do it" to be clearer and more readily available than staff did.

4.4 INTERACTION OF CONTENT, CONTEXT AND PROCESS (STUDY IV)

Grounded in the "professional path" strategy, the locus of responsibility was primarily placed on staff for the majority of the changes that were implemented (70%). Staff analyzed and developed change proposals for the different clinical pathways in working groups where managers acted as facilitators. After these kick-off camps, the managers reviewed all change proposals and decided which proposals to pursue. Then responsibility was returned to staff for further development and implementation. When the solution required changes of physical space and organizational structures, they shared responsibility as equal partners (24%) (Table 7).

The challenges addressed were evenly distributed between simple (34%), complicated (36%), and complex situations (30%). Most of the work to develop the changes implemented was either a combination of technical and adaptive work (60%), or primarily adaptive work (34%) (Table 7).

Table 7 Categorization of changes implemented in individual clinical pathways and at the organizational level with illustrative examples

Situation (n=53)	**Problem definition***	**Response***	**Primary locus of responsibility for the work**	**Kind of work**	**Decision-making process†**
Simple 18 (34%)	**Clear** 37 (70%) Unnecessary visits by pregnant patients with suspected intrahepatic cholestasis because patients were seen more acutely than evidence suggests is warranted.	**Clear** 6 (11%) To use recently developed regional guidelines to reduce unnecessary admissions due to trauma in pregnancy.	**Manager** 3 (6%) Managers were responsible for introducing the new guideline on "trauma in pregnancy" in the electronic guideline collection.	**Technical** 3 (6%) To implement the new guideline on "Trauma in pregnancy".	Sense **Categorize** Respond 2 (4%)
Complicated 19 (36%)		**Requires learning** 47 (89%) Developing networked, cross-sectional collaborations with interprofessional teams able to design individualized treatment plans for newborns who had lost weight.	**Manager and staff** 13 (24%) Redesigning the physical space of the new obstetrics clinic by merging four units. Managers held the responsibility for changing the physical space and organizational structures and staff was responsible for developing and testing the new workflows and new patient pathways.	**Technical and adaptive** 32 (60%) Reduce admissions due to postpartum hemorrhage. The technical work involved raising the limit for how much bleeding could be accepted without having to admit the patient for further observation. This change was based on the realization that the previous limits were based on insufficient evidence. The adaptive work involves changing the "better safe than sorry" culture.	Sense **Analyze** Respond 4 (8%)
Complex 16 (30%)	**Requires learning** 16 (30%) How to redesign the physical space of the new obstetrics clinic that arose from the merger of four units to improve patient flow and coordination and collaboration across organizational and professional silos.		**Staff > manager** 37 (70%) Responsibility for development of the group B streptococcal (GBS) test to prevent unnecessary administration of IV-antibiotics and the subsequent unnecessary admission for observation was held by a senior physician.	**Adaptive** 18 (34%) Iterative approach to redesign the physical space and the flow of patients and staff in the obstetrical unit.	**Probe** Sense Respond 0 (0%)

***The problem definition and responses are the same for simple and complicated, and complicated and complex situations, respectively.**

†The majority of the decision-making processes did not fit the theoretically pre-defined patterns as they involved more steps and are therefore not categorized in the table.

Most decision processes related to the changes that were implemented began with a complicated approach of analysis that involved process mapping. Thus, the decision-making processes in the department did not follow the patterns that matched the degrees of complexity outlined in the theoretically grounded framework. Instead, an even more adaptive approached was favored, which included an iterative process that led to categorization or probing of new and possible solutions. By analyzing multiple pathways and improvement suggestions, complex organizational challenge patterns emerged. Appropriate responses that addressed these previously unknown situations also emerged.

From a managerial perspective, it is possible to take a step back and look at the adaptive challenge they faced. The challenge was daunting and complex. The first step of the systematic analysis at the camps with staff was, from the managers' perspective, a testing of an approach to see if it resonated sufficiently for meeting this complex challenge. What emerged was a strategy that addressed different levels of complexity, making it possible to tailor better designed responses to the complexity level of the situation. Thus, the managers reframed the external efficiency requirement as a mandate to improve quality and care experience. They engaged staff in reflective dialogues, shared responsibility, and followed the strategy of "turning over every stone" in the department in order to reveal the complex challenges.

4.5 SUMMARY OF THE MAIN FINDINGS

Study I and Study III focused on exploring the context at the level of the individual organizational members and at the supra-individual level.

Study I found that staff and managers identified with different aspects of the Triple Aim that fell along classic professional divides. Thus, nurses and midwives focused on patient experience, the physicians focused on health outcomes, and the clinical managers focused on all three aspects (Figure 4). The understanding of change was guided by a Professional Ethos (the inner drive to improve care) mental model and a Socio-Political Discourse (the external requirement to become more efficient) mental model. The understanding of economics was guided by a You-Get-What-You-Pay-For mental model and by a More-Bang-For-The-Buck mental model.

A complex interplay could be discerned between all four mental models, which caused the staff to see the Triple Aim as a dilemma between quality and economics and as a threat to clinical care and quality. However, the managers saw the Triple Aim as a paradox that invited improvement efforts. Despite these differences, the managers chose the "Professional Path" strategy, which was in line with the dominant mental models of staff. An example of how the mental models can interact is presented in Figure 6. The figure illustrated how the managers' mental model of Socio-Political Discourse triggers awareness of the need for change. Mediated by the managers' mental models of More-Bang-For-The-Buck and Professional Ethos, they chose a "Professional Path" action strategy that resonated with the staff's Professional Ethos and did not trigger the You-Get-What-You-Pay-For mental model.

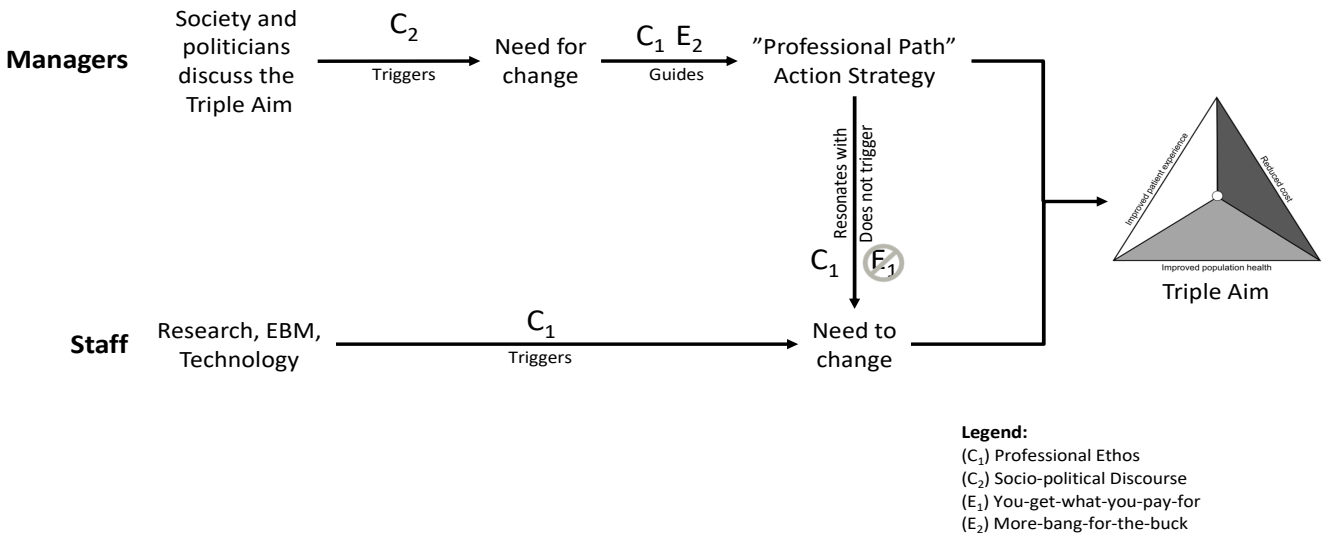

Figure 6 Simplified model of how mental models may mediate managers' action strategies and staff response

Study III found that the managers perceived the organization's readiness for implementing change to be significantly higher than the staff did. Temporarily employed staff were also more positive. Specifically, it was the change efficiency aspect that was higher. Thus, the managers were more behaviorally ready for change, perhaps because they had access to more organizational knowledge about "what to do" and "how to do it". The overall ORIC score had a median of 39 (35, 45) on the overall ORIC-scale (11-55). Change commitment had a median of 19 (16, 21) on the commitment scale (5-25), and change efficacy had a median of 21(17, 24) on the efficacy scale (6-30).

Study IV covers the longitudinal perspective and describe how the managers reframed the efficiency requirement as an opportunity for quality improvement. Multiple simple, complicated, and complex situations were addressed with a highly adaptive approach to quality improvement. Managers engaged staff through reflective dialogue, shared responsibility, and a strategy of "turning over every stone" in the department. This approach of systematically reviewing all clinical pathways revealed complex pattern of challenges that had previously been unknown to organizational members. Together they process-mapped, paying attention to patterns that emerged before deciding on the next steps. This procedure resulted in a complex process of probing into the large-scale complex situation the department faced. This was followed by iterative development and testing of new and possible solutions. Changes were made to address situations in clinical pathways for individual conditions (n=37), multiple conditions (n=7), and at the organizational level (n=9). At the organizational level, changes addressed referral practice, physical space in the department, flow and capacity, discharge speed, and managerial support. The changes were successfully implemented over three years.

5 DISCUSSION

Based on the four empirical studies, we can now discuss how constraints can drive innovation in health care design and delivery. This thesis illustrates how the innate uncertainty and unpredictability of complex and paradoxical challenges embodied by the Triple Aim can be turned into successful improvement through a process of continual learning supported by the following actions: accepting the challenge and reframing it as a stretch goal, surfacing and resonating with mental models, analyzing the situation and determining the level of complexity, sharing responsibility, and adapting the improvement approach.

5.1 INNOVATION INSIDE THE BOX – WHAT CAN WE LEARN FROM COMBINING THE FOUR STUDIES?

The findings illustrate that constraints, conceptualized in this thesis as the Triple Aim, can drive large scale innovation in a health care context. This thesis supports the assumption that the Triple Aim can be used to create paradoxical tensions that can drive innovation. In this case, the simultaneous attempt to improve care quality and patient experience and to reduce costs resulted in the implementation of significant changes at several levels, in the clinical pathways and in the organization and even at the regional level. Thus, when a Triple Aim requirement is reframed as an improvement effort that resonates with staff and managers' mental models, successful change can be achieved.

Traditional QI tools, such as process mapping and Lean, were potentiated by management practices grounded in complexity science such as the extensive use of probing and open dialogue that allowed new patterns to emerge (Study IV). Study I and Study IV illustrated how the efficiency requirement was reframed and translated into an improvement strategy that resonated with staff's mental models. Despite this strategy, a sense of uncertainty persisted among staff, as reflected in the low change efficacy score (Study III). Gaps existed between staff and managers which reflected the conflicting understandings of change and the cost and quality relationship (Study I). The fact that the managers perceived the organization to be more ready to change than staff did aligns well with the dominant "More-bang-for-the-buck" mental model of managers – their optimism reflected their mental model that cost reductions could lead to improvements.

5.1.1 Accept and reframe the paradox as a stretch goal

The managers interpreted, reframed, and presented to their staff the external demands to reduce beds and the budget as a mandate to improve health outcomes, better care experience, and reduce costs. In this way, the Triple Aim became a stretch goal. The case illustrates how, combined with managerial strategies that reflected the varying degrees of complexity, the pursuit of what may initially appear to staff as "impossible" and insurmountable stretch goals (May, 2007; Sitkin et al., 2011) can trigger large-scale improvement in health care.

The paradoxical nature of the Triple Aim challenge, when reframed as a stretch goal, became a "generative image", an image that was able to change "how people think about things" (Bushe & Marshak, 2015). Different aspects of the Triple Aim were *aligned* with the different logics of the professions (S Glouberman & Mintzberg, 1996) – the outcomes fit with the physician logic of cure, the patient experience fit with the nursing logic of care, and the costs aspect, which could

be expected to fit with the control logics of managers, was understood (though somewhat reluctantly) by all participants. The surfacing of the four mental models in Study I, revealed the inherent tension among the mental models that determined how the Triple Aim was understood and perceived by staff and managers. This discrepancy between these conflicting mental models suggests why the goals set by managers were *audacious* and *arduous.* The *audaciousness* is illustrated by the department managers choice of a demanding and time-consuming strategy to improve every clinical pathway by turning over every stone, instead of capitulating to the downsizing pressure by reducing staff and beds.

This audacious and untraditional approach to downsizing, triggered by the *reframing* of an efficiency demand into a stretch goal, changed the conversations that were occurring and that defined the organization (R. D. Stacey, 2011). The new conversations about what care should be inspired staff and managers to find innovative ways that were aligned with their professional values. The reframing was observed as managers explicitly chose to present the efficiency demand as an opportunity to make improvements and to tone down the need to cut costs. This improvement goal resonated well with the mental models of change and economics in health care, as identified in Study I.

The concepts of framing and reframing have been described extensively (Schön, 1983) in the change management literature. To reach consensus, different actors need to share collective perspectives. Framing has been used to understand how these different perspectives – frames – interact and possibly resolve differences (Schön, 1991). By building narratives around these frames, specific and shared meanings are constructed (Behr, Grit, Bal, & Robben, 2015).

At the same time, the studies also illustrate possible negative effects of setting ambitious stretch goals and creating adaptive change management strategies with their inherently high degrees of uncertainty and unpredictability. As Studies I and III illustrate, viewing the Triple Aim as a dilemma of inherently disparate aims, rather than as a paradox, can result in uncertainty, concern, and worry, especially for staff who may find that the challenge is insurmountable. Coupled with a mental model that leads to a grocery store model of the quality cost conundrum reinforces this dilemma. This is supported by the literature on downsizing that describes the negative consequences for staff in health care (Brown et al., 2003), which include a significant increase in "psychological distress" (Bourbonnais et al., 2005), increased burnout among nurses, and declines in job satisfaction (Nordang et al., 2010).

Department managers' efforts to handle these aspects did not fully succeed at the organizational level. The low efficacy score, i.e. the belief that the department could be successfully improved, could have been because not all staff were actively involved in the camps, workshops, and developmental meetings. Even if the commitment to achieve the Triple Aim was high, the disparate mental models and fluctuations in involvement could make it more difficult to see how the pursuit of the Triple Aim could be successful. This imbalance between commitment and efficacy is important to note and to address because it is a pattern that has been linked to burnout, low engagement, and low staff satisfaction (Christl et al., 2010; Hung & Chen, 2017).

5.1.2 Make explicit and resonate with mental models

Study I illustrates how different mental models exist simultaneously in a department, at times within the same individual, and how they can generate a complex interplay from which different behaviors emerge. The interplay and representation of the mental models were dependent on and influenced by the contextual situations, such as involvement in the camps, workshops, and meetings.

The way in which department managers communicated with staff and with hospital management differed. Study I showed that the different approaches to communication were grounded in two different mental models related to drivers of change and economics. However, this was not explicitly discussed or described by the managers themselves. They seem to have fortuitously adapted their interactions to their audience in a way that resonated well with the different mental models that dominated in these two groups. This raises the possibility of consciously and actively making explicit the mental models held by different groups and then speaking to these with intention and authenticity.

Managers may benefit from an active exploration of the deeply held assumptions in their own context. A strategy of surfacing, articulating, testing, and challenging mental models may be a good response for preparing the ground for health care innovation. More specifically, this could be done by using structured methods to expose those "big assumptions" that exist within health care organizations. The process of shared exploration of an organization's "Immunity to Change", as described by Robert Kegan and Lisa Lahay (Kegan & Lahey, 2001), is an example of such a structured way for organizations to gain deeper knowledge.

Alternatively, the mental models described in Study I may be a good place to start for an organization facing specific external downsizing requirements. Building on the tension between the Professional Ethos and the More-Bang-For-The-Buck mental models may be a good way to spark creativity. Further research could be conducted to determine how widespread these models are in other health care organizations, or if they can be related to contextual forces, such as repeated efficiency demands.

5.1.3 Analyze the complexity of the situation

The growing understanding of the impact of contextual complexity on improvement has clear implications for health care managers. In this case, managers invited staff to analyze care pathways. Somewhat innocuously, this seemingly mundane and expected task is often a staple in change efforts and is not new (Johnson et al., 2012; Mazzocato et al., 2010). However, the disciplined approach used in this case made clear to staff and managers the wisdom of developing different approaches to address the problems and challenges they identified. That said, they were unaware of how this resonated with different levels of complexity. The difference could be because the managers created the space and opportunity to develop a response. Other hospitals using process mapping have followed it with top-down, predetermined, and pre-established solutions or solution processes, without adequate tailoring to the context and sometimes to the ire of those involved (Mazzocato et al., 2014)

The inclusive, active, and extensive analysis phase (process) that followed the development of the master plan, where every stone in the department was turned, led to the realization among staff and managers that there were certain challenges that were more difficult to define and address than others. This is an example of a management strategy that fits well with the highly complex context and challenge the department faced. As Leonardi (2011, p. 149) explains,

> Problem definition is not always a straightforward task because problems do not exist "out there" waiting to be found and solved. During its earliest stages, innovation might best be cast as a process of problem construction.

In the model for improvement, the first question is, "What are we trying to accomplish?" This is a question that works well when the problem or challenge is more readily identifiable. Similarly, the other two questions, "How will we know that a change is an improvement? and "What change can we make that will result in improvement?", are intended to develop, frame, and contain a manageable improvement project. However, complex challenges are difficult to "put a finger on" and require at a minimum an iterative application of the PDSA-tool to begin to define a problem clearly. In addition, defining the challenge often requires time and a process of probing to develop insight and perspective through, for example, open dialogue (Bushe & Marshak, 2015; Snowden & Boone, 2007), fluid conversations (R. Stacey, 2001), or going to the balcony to observe the ongoing conversations (Ronald A. Heifetz & Linsky, 2002). Thus, when things are complex, organizations may benefit from the ability to pause or even depart from their application of the Model of Improvement in order to determine the level of complexity of the situation and the degree to which learning processes need to be supported in order to understand the challenge or to support the development of a response. The Complexity Analysis Framework, as developed and modified in Study IV, could support managers in knowing when to do this.

5.1.4 Shift the locus of responsibility and practice "negative capability"

Managers demonstrated their ability to deal with "being in the uncertainties" (Simpson, French, & Harvey, 2002) as they shared responsibility for developing solutions with staff for the majority (70%) of the changes that were implemented. The majority of organizational members were committed to implementing change, even though commitment seemed more grounded in the perception that the department "had to" rather than "wanted to" become more efficient. Based on this case, a focus on the process together with a meaningful purpose – the essence of Adaptive Leadership (R.A. Heifetz, 1994) – seems to be a more important indicator of successful change than the general level of organizational readiness for implementing change. Leaders managed to move between the "dance floor" and "the balcony" (Ronald A. Heifetz & Linsky, 2002). They iterated and moved between interdisciplinary analysis of pathways and managerial reflection and prioritization of possible paths forward, while involving staff and letting them take responsibility for developing improvement suggestions, testing them, and driving implementation.

The large degree of shared responsibility can be understood in the light of several new frameworks developed to broaden the understanding of how change happens in complex systems (Dougall, Lewis, & Ross, 2018; Heimans & Timms, 2014; Laloux, 2014). The studies illustrate how the clinical leader challenges "old power values", such as the power to make decisions, is often held by a select few who command and push down on staff who are only allowed a small

role in the larger processes (Heimans & Timms, 2018, p. 196). The high level of shared responsibility resonates more with "new power values" such as the idea that change is made by many people, with a high degree of distributed decision-making and self-organization, shared responsibility, transparency, and collaboration – a "do it ourselves" rather than a managerial focused "do it yourself" approach.

This was clearly illustrated in the way the managers took responsibility as change facilitators in engaging in open dialogue with staff and participating not only as leaders but also as learners. The shared responsibility for developing better responses, which the studies illustrate, represents a shift in the power balance within relationships that align well with recent descriptions of transformational change processes that are "multi-layered, messy, fluid and emergent" (Dougall et al., 2018).

Managers' ability to handle uncertainties can be linked to the concept of "negative capability", i.e. the state where a person "is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason" (Keats, 1970: 43., as cited in (Simpson et al., 2002). Demonstrating negative capability allowed the leaders to stay reflective in action and to resist the desire to choose technical solutions in the face of complex challenges (Sholom Glouberman & Zimmerman, 2002; R.A. Heifetz, 1994; Simpson et al., 2002). The open dialogues that the managers attended both as facilitators and learners helped create a safe environment where new ideas were welcomed and allowed to fail (Bushe & Marshak, 2015; A. C. Edmondson, Higgins, Singer, & Weiner, 2016; Nawaz et al., 2014).

Practicing negative capability means that leaders should be able to "contain those aspects of a situation that are themselves 'negative', such as not knowing what to do, not having adequate resources, and not trusting or being trusted" (Simpson et al., 2002). They need to be able to wait until insights emerge – in this case, the patterns of complex situations (larger organizational problems) that were unknown to staff and managers until extensive analysis and reflective dialogue were employed together. This capability is not something clinicians or clinical managers usually train for or are even familiar with.

The practice of medicine in a modern health care system is often a highly structured and organized process, where staff are trained and expected to follow highly structured and clearly specified guidelines for all the medical conditions and procedures they may encounter. The trend is to reduce uncertainty by following structured algorithms (evidence-based guidelines) that favor the "positive capability" of being able to take action (Braithwaite et al., 2017, p. 64). Modern medical practice involves a decision-making process that resembles many of the structured QI methods that are often promoted in health care to reduce variation and to standardize care. This is antithetical to, as well as encouraged and driven by an active rejection of the practice of negative capability. More "modern" evolutions of organizational theory refer to organizations that have developed their negative capability as "teal organizations", where responsibility and power can be shared and shifted in more fluid ways in response to dynamic contexts (Laloux, 2014).

5.1.5 Adapt the improvement process to the level of complexity

The findings illustrate that in a large-scale improvement initiative with an overall high level of contextual complexity, simple, complicated, and complex problems were addressed in pursuit of the Triple Aim. The encouragement of probing through the systematic exploration of multiple care processes resulted in a large number of improvement suggestions and exposed patterns of challenges that could solve more global organizational problems.

The professional path strategy outlined in the "master plan" was developed in the collaboration between managers and staff representatives and was followed by interdisciplinary "Creativity Under the Gun" camps. These created the space for reflexive dialogue, which matched the high level of complexity in the department's overall challenge. Thus, the process of extensive collective analysis could, from the larger perspective, can be understood as one of probing and sensing, which allowed appropriate responses to be developed (Snowden & Boone, 2007). Edmondson describes this as a process of identifying opportunities for innovation, i.e. asking "What opportunities might we explore?" It is in contrast to the questions commonly posed in hospital boardrooms and improvement teams, such as, "How are we performing against target measures?" and "Select a performance dimension and an approach for improving it", which are more suitable for routine operations (A. Edmondson, 2012, p. 243).

The mismatch between solutions/responses and the level of situational complexity in health care has been noted by others. Glouberman and Zimmerman (2002) describe how health care experts often underestimate the level of situational complexity and employ solutions that are dominated by rational planning approaches because they treat challenges as, at most, complicated, instead of complex. A more fruitful alternative, they suggest, is to recognize complexity and rephrase simple questions into complex ones. Study IV illustrated how four principles guided this process of questioning the "status quo". Questions such as "*How can we support the realization that patients prefer to be at home?*" or "*How can we improve coordination and collaboration within each pathway and across organizational boundaries?"* facilitated deeper learning and helped staff and managers to realize and reassess their assumptions about care. Similarly, Greenhalgh et. al. (2018) developed the NASSS framework to "encourage complexity thinking [...] about technological innovations in healthcare".

In the NASSS framework, as with the Complexity Analysis Framework developed in Study IV, situations are analyzed using seven categories divided into simple, complicated, and complex in order to understand how to improve the adoption, scale-up, and the sustainability of health care technologies (Greenhalgh et al., 2017). Greenhalgh's framework aims to improve how technology is developed and implemented in the health care context. Yet the NASSS framework does not include which decision-making processes may best fit the level of situational complexity identified. The Complexity Analysis Framework for QI makes theory-informed suggestion for decision-making processes. The empirical findings do not suggest that decision-making processes are as simplistic as stated in the framework. Yet to move forward with the complexity level categorization, this pragmatic framework may be a good step towards making complexity thinking actionable. Preferably, when things are complex, what we can hope to develop are our responses as we are unable to both grasp and deal with all the interactions that lead to the

emergence of the phenomenon we are trying to address (R. D. Stacey, 2011). By thinking in terms of responses, we accept that these responses will impact the process and organization such that new technical problems and adaptive challenges will emerge.

5.2 COMPLEXITY INFORMED QUALITY IMPROVEMENT

This thesis illustrates how improvement and innovation can occur in the juxtaposition of paradoxical constraints – as embodied in the Triple Aim of health care. The core of this downsizing case became an extensive quality improvement effort. Thus, the findings can be used to complement, and have implications for, the field of QI. When the findings are compared with the profound knowledge of improvement, it becomes clear that we need to better understand how innovation, psychology, and complexity science can inform quality improvement efforts and the implications this knowledge has for practice and research.

The framework for continual improvement in health care, developed by Batalden and Stoltz (1993), describes how a body of knowledge – improvement science – combined with the professional knowledge of health care professionals can shift improvement in health care. This shift is from traditional improvement grounded in knowledge of subject and discipline in the context of shared underlying values to a continuous improvement driven by profound knowledge of the system, variation, psychology, and theory of knowledge. However, the efforts to understand the system, processes, and data (as defined by the profound knowledge of improvement) have not yet yielded the hoped-for results (Braithwaite et al., 2017). One hypothesis is that the systems thinking that underlies the dominant theories for achieving improvement in health care (Batalden & Stoltz, 1993) actually make improvement more difficult because they are characterized by the use of simplistic, linear processes, static models of change, and rationalistic approaches to implementation, which are unlikely to achieve the large-scale "disruptive innovations" that modern society demands (Sholom Glouberman & Zimmerman, 2002; Greenhalgh et al., 2018).

This dominant scientific paradigm in medicine – the biomedical model of diagnostic reasoning and therapeutic intervention – is challenged by complexity thinking (Sturmberg et al., 2014). A paradigmatic inconsistency can be recognized, and several authors emphasize that an increased focus on complexity is needed to accommodate future challenges (Braithwaite et al., 2017; Sholom Glouberman & Zimmerman, 2002; Greenhalgh et al., 2018; Plsek & Greenhalgh, 2001; Sturmberg et al., 2014; Zimmerman et al., 1998).

Complexity science offers a different view of the dynamics of organizational reality that could prove to be relevant for managing change and improvement in health care. Through a complexity lens, organizations can be seen as evolving dynamics that are continuously emerging and developing with fuzzy, semi-permeable, or even open boundaries. To lead the exploration of complex challenges and to develop appropriate responses requires careful attention to "people, motivations, values and professional norms, and to put mechanisms in place to detect deviations from expected outcomes, identify the numerous contributory causes and make timely adjustments by adapting technologies, practices and workflows" (Greenhalgh et al., 2018). This thesis demonstrates how knowledge from the fields of innovation, organizational psychology, and complexity science can complement and further develop the "profound knowledge" that Deming described based on his observations in manufacturing.

The knowledge about the system, services, and processes that should guide managers to continually improve may be complemented by an approach that departs from managers' attempts to understand and control the system toward an approach that focuses on setting stretch goals that resonate with staff mental models and establish collective learning processes. To do this, leaders may benefit from focusing less on understanding the system because complex systems are, by definition, difficult to grasp. Instead, they could focus more on probing into the challenges together with staff, while acknowledging the complex patterns needed to improve and innovative can only emerge by working with rather than trying to control for the complexity of the system. As summarized by Holmes et al. (2017), "the key to success is working with, rather than trying to simplify or control, complexity". In praxis this means that managers need to master the negative capability of "not knowing", to develop the courage to set audacious stretch goals, to probe into the unknown, and to acknowledge the humility needed to pursue these goals. This can be done by sharing responsibility with frontline staff. This is written with full awareness of the challenge that this way of thinking represents for many managers in terms of requiring a shift in mindset, paradigms, and basic assumptions related to the logic of control.

Secondly, knowledge about variation can be difficult to use when facing large-scale change in a complex system. A focus on variation can lead to an overemphasis on quantifiable data related to production, rather that the parallel explorations needed to uncover and related to the deeper purpose and deeply held assumptions held in health care organizations. The definition of complex challenges is that the "problem" is not understood or even acknowledged (Snowden & Boone, 2007). Greenhalgh (2017) describes such problems as "dynamic, unpredictable, not easily disaggregated into constituent components". Thus, monitoring the production process in search of special cause variation may be a difficult task in the realm of complexity.

Thirdly, knowledge about psychology and shifting the focus from individual to system behaviors may be complemented by surfacing, exploring, and testing organizational mental models. Doing so could assist leaders in creating generative images that include the ambiguity and paradoxical tension needed to drive innovation processes in health care.

Fourthly, unreflective use of the Improvement Model to support improvement may be difficult in complex situations because of the following problem: How will you get the cycles started, when learning is required to even describe the challenge? Even trying to "State the question you want to answer" can be difficult. And it can be tempting to begin with the simple problems in which a diagnosis can be made immediately, planning can begin, and in accordance with the Kotter eight-step approach to change (Kotter, 1996), early wins can be used to build momentum. But such an approach will likely fail to produce appropriate responses to the complex challenges societal demands place on health care organizations.

This case study of a "real life" improvement project, where improvement occurred without a structured use of stepwise-tools such as the Model for Improvement or even a high level of change efficacy, illustrates that managers may benefit from challenging the conventional wisdom on change within the domain of quality improvement. They can instead take time to reframe, explore, and design processes that build commitment and motivation. The emphasis should be on setting ambitious (stretch) goals that aim to improve, while simultaneously acknowledging that we are

not sure what is possible. To embrace uncertainty and set stretch goals may be key activities – and they might even result in the use of stepwise-tools once the challenges are better understood.

Perhaps practitioners of improvement science in health care should recognize that the current conventional wisdom related to the four concepts of the profound knowledge of improvement is rooted in an understanding that predates the realization of the implications of complexity thinking. While the headings themselves may be correct, the application of these older understandings of particularly systems and psychology are less well-suited for the larger structural problems that modern health care faces and do little to placate the frustration and anxiety that hospital staff experience. An approach that includes training in both negative and positive capability, and which resonates with the unpredictable nature of the challenges we face, may be a better way to support staff than simple, unreflective applications of tools and methods. If managers preface this by translating and reframing societal pressure and creating space for staff to reconceptualize and redesign their work, not only can this foster exploration and nurture creativity, it might also be common sense. This thesis shows that when you are facing a paradox, as captured in the Triple Aim, traditional quality improvement may be complemented by change management practices that resonate better with the uncertainty and unpredictably that characterize complex situations.

5.2.1 Implications for practice

Many health care organizations face challenges similar to the ones faced by the department studied in this case. Therefore, the implications derived from the findings suggest that traditional approaches to quality improvement can fall short when complexity increases. There are therefore certain aspects and process strategies that managers should consider when trying to innovate and improve quality in the context of external pressures to downsize (Figure 7).

To make mental models explicit and to design strategies that resonate may be the most appropriate responses that drive innovation and improvement in the face of the Triple Aim. To surface and collectively explore individual and organizational mental models is key in relation to all levels of situational complexity and phases of change processes. Thus, the focus of the explanatory model (Figure 7) is not only to develop appropriate skill-sets for different contextual situations – it is to acknowledge that a shift in mindset is needed when we face adaptive challenges. In Figure 7, this is illustrated by the surrounding iteration of surfacing, articulating, testing, and challenging mental models.

The key message for future adaptive leaders is that the following: *Health care has an infra-structure that needs to be re-purposed*. Uncovering the deeply held assumptions that guide our understandings and actions is paramount for the success of change processes in an increasingly complex health care systems faced with ongoing efficiency requirements.

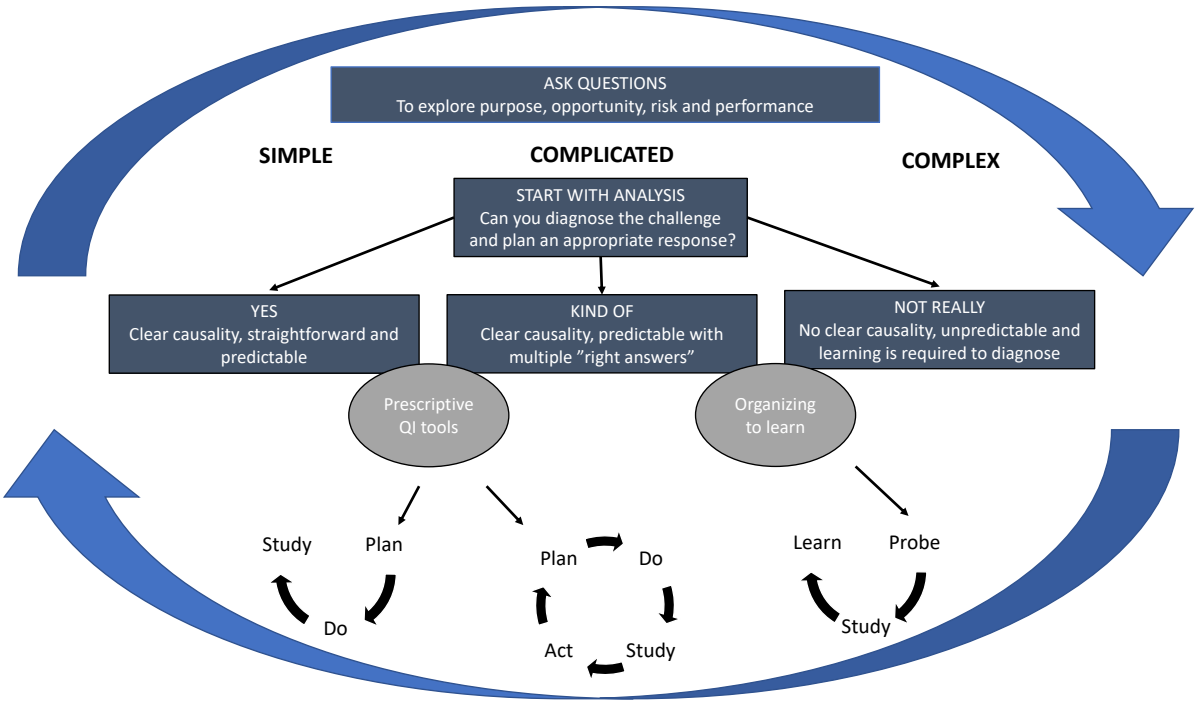

Figure 7 Explanatory model of how knowledge from complexity science, organizational psychology and the field of innovation can be used to inform quality improvement efforts

To be able to re-purpose and adapt strategies for improvement to different levels of complexity, adaptive leaders may compliment their skills to lead improvement as follows.

ASK QUESTIONS that explore purpose, opportunities, risk, and performance in order to identify and capture possible challenges. This process of questioning includes accepting paradoxical challenges and reframing them as stretch goals. It also requires that one trains negative capability.

ANALYSE THE CHALLENGE you are facing – are you able to diagnose the challenge?

A. If yes, you are most likely facing a simple problem, which can often be solved by implementing an already existing solution. Explain it to your staff, and then plan, implement, and evaluate.
B. If you can *kind of* diagnose the challenge, you may be facing a more complicated challenge where there are most likely several possible responses. Working together with your staff, you can try to plan what may seem to be the best response, execute the plan, study the results, determine how to amend your plan, and act differently. Continue until sustainable improvement is achieved.
C. If it is difficult to diagnose the challenge, you may be facing a complex challenge with no clear ways forward. Engage your staff, shift the locus of responsibility, and task staff to probe the situation by learning what already works well, trying out different ideas, and then studying the effects to learn more about the challenge and how it can be addressed. With a clearer understanding of the problem, you will be able to return to planning.

Between simple problems (Option A) and complicated challenges (Option B), there are many opportunities to use prescriptive models of change and improvement, such as improvement bundles, implementation frameworks, or one-off improvement efforts. Between complicated (Option B) and complex (Option C), the higher degree of complexity can be addressed by using paradoxes to develop stretch goals that challenge preconceived notions and deeply held assumptions of how work should be done. Methods derived from the field of innovation such as design thinking, prototyping, experimentation, and a focus on collaboration across boundaries are needed to support organizational learning.

Moreover, the findings suggest the need to deal with highly complex and paradoxical challenges that have a great deal of uncertainty, worry, frustration, and perceptions of low organizational change efficacy, even though the commitment to implement change may be high. Thus, change strategies need to address this uncertainty by supporting staff in adjusting to the change process, in supporting managers in developing their capabilities for handling uncertainty and by adapting and making timely adjustments to their responses with staff, and by developing a psychologically safe work environment.

5.2.2 Implications for research

Improvement science has its roots in engineering and the idea of understanding processes and systems. Improvement is the result of a systematic approach that starts by defining what we are trying to achieve, identifying measures that can help us understand if a change is an improvement, and then planning changes that could lead to an improvement. The research presented in this thesis shows that when the relationship between the problem, the improvement intervention, and the outcome is unpredictable and not linear, complexity science offers some key insights.

This suggests that we need to move from conceptual explorations of complexity in health care to more empirical explorations. These could include how conversations between employees develop as a result of change processes instigated by the Triple Aim, how active explorations of mental models can impact an organization's readiness for change and the ability to realize meaningful change, and how to clarify the relationship between commitment, efficacy, and outcome.

5.3 METHODOLOGICAL CONSIDERATIONS

In this section, I will discuss my reflections on the methods I used in this research project. As this was a single case study, I will start with Yin's criteria for judging the quality of research design. Then I will reflect on the implications of being a researcher in one's own organization.Finally, I will discuss the possible effects that my interactions during the development of the research proposal, my observations, the multiple conversations, and my mere presence in the department may have had on the research.

Yin (2009, p. 45) outlines four criteria to consider when testing a research design in the field of social science: construct validity, internal validity, external validity, and reliability. *Construct validity* refers to the ability to "identify correct operational measures for the concept being studies". *Internal validity* covers the quality of the study design and how well the study is conducted. For explanatory studies, this covers the ability to "establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious

relationships". *External validity* is about "defining the domain to which a study's findings can be generalized". *Reliability* refers to the ability to "demonstrate that the operations of a study – such as the data collection procedures – can be repeated, with the same results". In case studies, several tactics can be employed to strengthen validity and reliability.

The rationale for using a single case was the unique and extreme situation the department downsizing represented. The situation was complex, unusual, and fully captured a very common challenge in modern health care delivery. Thus, the case represented an opportunity for an observational study of a natural experiment. As a researcher, I had no control over the change strategies or processes that were used, which made the case study methodology the most suitable choice. Moreover, my access to the department and the unique opportunity as an embedded researcher over the whole study period allowed for a longitudinal perspective, which fits well with case study design.

To ensure construct validity, multiple data sources and multiple methods were used together with different change management theories from the fields of improvement science, complexity science, and organizational psychology to support explanation building.

By using different data sources, we were able to focus on various aspect of the change process. Exploring this process, at the levels of the organization and its individual members from an organizational perspective further supported the internal validity of the findings. Moreover, the continual and close dialogue with key informants, especially the department management, ensured that relevant data were collected, both in the form of documents and opportunities to make relevant observations. A limitation to the data collection was the fact that the gynecological section held fewer workshops and did not distribute as many action plans as the obstetrical section did. Fewer documents were therefore produced. This difference between the sections may have limited my access to data on specific changes made in the gynecological section and thereby introduced a selection bias. However, my longitudinal observation and continuous dialogue with department managers reduced this risk of not capturing changes that were actually implemented.

Studies I, III, and IV, which had an exploratory character, raised several possible hypotheses about how and why change happened. However, the individual studies were less concerned with causal relationships. The overall explanation was based on triangulation of the findings from all the studies. Several aspects of the data collection strengthened the internal validity of the research at this overall level. These aspects included the random selection of interviewees from all staff groups and my position as an embedded researcher in the department. Having an office in the department management ward, access to "membership" of department mailing lists, and access to internal calendars helped me conduct data collection and explore possible alternative explanations.

My position as a researcher with a large degree of access to the organization further reduced the risk of inference, which is a common concern in relation to the internal validity in case studies. The fact that I was continuously present in the department during the whole study period reduced the number of events that I was unable to directly observe. This reduced the number of situations

where I, as a researcher, had to "infer" that particular events resulted from previous occurrences. (Yin, 2009, p. 47).

In addition, the longitudinal case study design is valuable when trying to establish the link between cause and effect. The longer the study period, the better the opportunity to observe causal relationships (Voss, Tsikriktsis, & Frohlich, 2002). The ongoing dialogue with the department managers and external researchers during the analysis, together with continuous reading of relevant literature, helped me build explanations and further strengthen the internal validity of the study (Shenton, 2004). However, there is an inherent risk of bias when one is a researcher in one's own organization (see Section 5.3.1).

The use of different theoretical perspectives, such as readiness for change, mental models, and double loop learning, and the use of complexity science supported the development of relevant research questions, the study design, and the *analytical generalization,* which underlie case studies (Yin, 2009). The in-depth case description (Study IV), which developed from this single case study, also allowed the findings to be carefully generalized to other settings. Additional explanatory studies that uses other methods and change theories could further expand our understanding of how constraints can drive innovation in health care.

To ensure reliability, the case study was described in a study protocol and data collection was documented in a database created in NVivo. Moreover, the translation and validation of the ORIC questionnaire followed standard procedures for forward and back-translation, face validation, and content validation, followed by factor analysis and the Cronbach alpha test. The statistical analysis was performed by an external statistician. To strengthen trustworthiness and mitigate the risk of bias, particularly for the first author, four researchers individually reviewed and categorized the codes of the interview study (Barry, Britten, Barber, Bradley, & Stevenson, 1999). Through iterative cycles of analysis, discrepancies were discussed and resolved. The descriptions of the changes in pathways and the organization that were implemented were also developed and categorized in a collaborative process (Study III). Analyzing data from interviews, documents, and observations together with researchers external to the department helped to counterbalance the risk of a "pro-innovation" bias, i.e. the risk that the observer becomes an advocate, rather than an observer (Voss et al., 2002). The first author's role was also continually reflected on in the research group and with one department manager. All interviews were digitally recorded and transcribed verbatim, thereby reducing the risk of recall bias and increasing the reliability of the data.

5.3.1 Researcher in my own organization

I received my resident training as an OB/GYN physician in the study department and had a clinical employment before I started this research journey. At the time of the study, I was employed as a researcher in the department, but was externally funded by Aarhus University, Aarhus University Hospital and Central Denmark Region. My supervisors, who were all external to the department, were from the Medical Management Center at the Karolina Institute (KI) in Stockholm, Sweden, and the Clinical Institute of Medicine at Aarhus University (AU) in Aarhus, Denmark. This intimate involvement with the department and its members can raise questions about neutrality and objectivity.

Doing research in one's own organization has several advantages as well as inherent challenges (Alvesson, 2003). Such a role can be justified as it offers *access* and *understanding of the context* for the subject of interest, which would be more difficult, if not impossible, to obtain without this close relationship to the study setting. Access is a key requirement for this kind of organizational research because it refers to "the opportunities available to find empirical data (real-world data) and information" (Gummesson, 2000). Moreover, contextual understanding is key in organizational research as "Organizational behavior can only be understood in context" (N Fulop, 2001). Thus, in this case study it can be argued that my employment in the departments was an asset that allowed me to develop a deeper understanding than a more conventional qualitative research design would have allowed.

For example, the idea that through interviews a researcher can capture genuine experiences has been described as both naïve and rather romantic. It can be impossible to separate "correct information", "authentic experiences", or distortions. Instead, interviews should be considered as a scene for social interaction (Alvesson, 2003). The single case study approach, where I was a researcher in my own organization, represents an ambitious alternative with a longer period of fieldwork. Alvesson described this approach as self-ethnography (not to be confused with auto-ethnography). It's a situation where the researcher has a "natural access" and is an active participant, more or less like other participants. In other words, the researcher is a participating observer.

The role I had in most of the workshops can best be described as a participating observer because I allowed myself to contribute to the discussion with questions and actively participate in evaluation of the workshop days together with the department managers. To address the risk of bias that this approach introduces, I continuously reflected on my own role (documented in my field notes). I analyzed the notes immediately after the observations, which helped me gain insight into the interactions that had occurred. In these journal notes, I reflected on feelings, atmosphere, and my own ideas. My reflections were discussed with the department managers and my supervisors. I experienced that over time my interactive participation in actual meetings that I observed became less – as I positioned myself more in the researcher role than as a participant in the discussions. Moreover, I experienced that taking field notes on my laptop further allowed me to be more distant as an observer.

As my researcher role also included access to confidential knowledge, I chose a more distant position in the department in general, which helped me balance the risky business of doing research in the "swampy lowland of my own organizations" (Coghlan & Brannick, 2010, p. 121). Moreover, respect for the feelings and interests of the study participants is an important guide for this kind of research (Alvesson, 2003). Participants' permission regarding research publications was obtained. I handled this by sending all quotations to the interviewees and asking for their comments and reflections before publishing them in anonymized format. My background as a specialist in OB/GYN, but without being permanently employed in the department, further helped me gain access and yet maintain a distant view of the department.

The self-ethnographic approach allowed me to come close to the organization and to observe a "rich variety of naturally occurring events" (Alvesson, 2003). Having "been there" provides an

opportunity for a deeper understanding than just interviewing or sending out a questionnaire (Alvesson, 2003). It is an opportunity to discover aspects that would not necessarily surface from interviews. The less formal conversations with the informants were a valuable supplement to this method. The advantages of being an insider is the potential to reveal the "true story" and the ability to obtain deep access, which a conventional ethnographer undoubtedly would struggle to gain. Moreover, the more profound and deeper knowledge of the setting may contribute to theoretical development of fuller observations and experiences than is possible for an outside researcher.

Being an insider researcher also has inherent limitations. For example, there is a risk of getting "caught up in the taken-for granted assumptions and ideas that are broadly shared between the researcher and the researched" (Alvesson, 1993). The focus of Study I was specifically deeply held assumptions (Kegan & Lahey, 2001), which helped me position myself in relation to the "blind spot" of the organization and myself. Moreover, the fact that my research subject (change management) was different from my usual work as a physician in the department, further strengthened the experience of "going native" in my own organization. Being a novice to the field of change management, permitted several natural "struggles to achieve closure", which especially helped me gain perspective on the mental models identified in the study.

Another challenge is the difficulty handling the large amount of empirical material and managing to produce text that cover the collected data (Alvesson, 2003). There is a risk of creating a fictional text that does not do justice to the case studied. As I learned from my observations and the document analysis, the case was in many ways successful. Beds were closed as planned, staff was reduced without having to fire anyone, and a very large number of changes were implemented. However, I observed that the staff was frustrated during the period of downsizing (2014) as well as for several years afterwards. This was a possible frustration that was well aligned with the literature on downsizing (Bruton, Keels, & Shook, 1996), but was not addressed in my initial research questions.

Thus, the story of success has nuances that are not well covered in the different studies. My awareness of this issue, and the underrepresentation in my texts, led to reflective discussions with the physician department manager, and my supervisors. As a result of these conversations, a "Maslach Burnout Inventory" (Maslach, C. Jackson, 1981) was distributed in the department in December, 2016. The results of the questionnaire are not included in my studies. Yet, these results affect my overall understanding of the case and illustrate a common challenge in case study research. This is an example of asking "what the hell do *we* think we are up to?" instead of the question of a conventional researcher that typically asks "what the hell do *they* think they are up to?" (Alvesson, 2003).

5.3.2 Self-ethnography, interaction, or action research?

As a participant observer, I engaged in multiple conversations and I experienced how my data, theories, and actions as a researcher developed over time. My research, is in line with several action-research principles (Coghlan & Brannick, 2010), but does it qualify as *action research?* No, because the research did not include an opportunistic planning, which is,

> An emergent inquiry process in which applied behavioral science knowledge is integrated with existing organizational knowledge and applied to solve real organizational problems. It is simultaneously concerned with bringing about change in organizations, developing self-help competencies in organizational members and adding to scientific knowledge. Finally, it is an evolving process that is undertaken in a spirit of collaboration and co-inquiry (Shani and Pasmore [1985]: 439).

The department management team and I designed the collaborative alliance in a joint meeting. This alliance was further discussed with the physician manager. I was granted full access to the physician manager's calendar and was invited to attend all relevant meeting related to the project. Development of the change process was continuously discussed with external researchers at KI. However, the department was not obligated to obtain consensus with the research team in developing the change process that required downsizing in the department. Thus, the discussions served as an "*interaction"* that could inform decisions taken by the practical system and the research system (Ellström, 2007). We agreed that my role was not to act as an expert who told the department what to do (Coghlan & Brannick, 2010), but rather to act as a partner who aimed to use the opportunity to create new knowledge and to make organizational learning explicit.

However, did our interactions nonetheless impact the decisions that were made? Yes, it can be argued. For example, while my research plan was developed in collaboration with researchers from KI and the physician department manager, the "master plan" of the downsizing process was also developed in the department (2013). In developing the research proposal, change management theory and especially complexity theory (R. D. Stacey, 2011) and the Triple Aim framework were discussed extensively. In my case analysis I found, that these theories presented by the researchers seemed to resonate well with the managers. In addition, the midwife department manager, during the same period, was working on a Master's degree in "Leadership and Innovation in Complex Systems" at the Copenhagen Business School, where Stacey and complex responsive processes were part of the curriculum. The "professional path" strategy that department managers developed largely echoes Deming's thinking and the Triple Aim framework we had discussed with the KI researchers. Thus, one can argue that our conversations to develop the research project impacted the actions that the managers took. From the perspective of complexity science and specifically the theory on complex responsive processes (R. D. Stacey, 2011), this effect is not surprising. Still, the classical steps in action research, such as the iterative process of constructing → planning action → taking action → evaluating action (Coghlan & Brannick, 2010), cannot be identified in the research I have conducted.

6 CONCLUSION

The juxtaposition of paradoxical constraints, as framed in the Triple Aim of health care, may be used to drive innovation and to make improvements in health care. In the face of efficiency requirements, the case explored in this thesis demonstrates that simple, complicated, and complex challenges can be identified, and appropriate responses can be developed. When downsizing requirements are accepted and reframed as stretch goals that resonate with the dominant mental models of change and economics in health care, innovation can occur at the department level. By integrating insights from complexity, this thesis demonstrates how QI efforts can be used to support innovation intended to achieve the Triple Aim of health care. These efforts include, for example, selecting strategies appropriate to the level of complexity, such as probing, analyzing, or categorizing. Questioning and exploring assumptions and sharing responsibility with staff are appropriate at all levels of complexity. Managers need to deal with the high levels of uncertainty, including the worries and concerns of staff, that are associated with large-scale, complex changes like the change studied in this thesis. Thus, managers may benefit from reframing societal discourse and efficiency demands as stretch goals that resonate with staff's professional ethos. Ultimately, acknowledging the inherent uncertainty related to developing adaptive responses to paradoxical challenges may be a key step for clinical leaders.

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8 REFERENCES

Agarwal, N., Grottke, M., Mishra, S., & Brem, A. (2016). A Systematic Literature Review of Constraint-Based Innovations: State of the Art and Future Perspectives. *IEEE Transactions on Engineering Management*, *PP*(99), 1–13. https://doi.org/10.1109/TEM.2016.2620562

Aiken, L. H., Sloane, D., Bruyneel, L., & Heede, K. Van den. (2015). European countries : a retrospective observational study. *Lancet*, *383*(9931), 1824–1830. https://doi.org/10.1016/S0140-6736(13)62631-8.Nurse

Alvesson, M. (1993). *Cultural Perspectives on Organizations*. Cambridge University Press.

Alvesson, M. (2003). Methodology for close up studies–struggling with closeness and closure. *Higher Education*, *46*, 167–193. https://doi.org/10.1023/A:1024716513774

Amabile, T., Hadley, C. N., & Kramer, S. J. (2002). Creativity Under the Gun. *Harvard Business Review*, (August).

Arnetz, B. B. (1999). Staff perception of the impact of health care transformation on quality of care. *International Journal for Quality in Health Care*, *11*(4), 345–351. https://doi.org/10.1093/intqhc/11.4.345

Ball, J. E., Bruyneel, L., Aiken, L. H., Sermeus, W., Sloane, D. M., Marie, A., … Consortium, C. (2018). Post-operative mortality, missed care and nurse sta ffi ng in nine countries : A cross-sectional study. *International Journal of Nursing Studies*, *78*, 10–15. https://doi.org/10.1016/j.ijnurstu.2017.08.004

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Barry, C. a, Britten, N., Barber, N., Bradley, C., & Stevenson, F. (1999). Teamwork in Qualitative Research. *Health (San Francisco)*, *9*(1), 26–44. https://doi.org/10.1177/104973299129121677

Batalden, P. B., & Stoltz, P. K. (1993). A Framework for the Continual Improvement of Health Care: Building and Applying Professional and Improvement Knowledge to Test Changes in Daily Work. *The Joint Commission Journal on Quality Improvement*, *19*(10), 424–447. https://doi.org/10.1016/S1070-3241(16)30025-6

Behr, L., Grit, K., Bal, R., & Robben, P. (2015). Framing and reframing critical incidents in hospitals. *Health, Risk and Society*, *17*(1), 81–97. https://doi.org/10.1080/13698575.2015.1006587

Bergin, E., & Savage, C. (2011). Surviving multiple obligations through stimulation, autonomy, and variation. *Journal of Health Organization and Management*, *25*(4), 455–468. https://doi.org/10.1108/14777261111155056

Berwick, D. M. (2003). Improvement, Trust, and the Healthcare Workforce. *Quality & Safety in Health Care*, *12*(Supplement 1), i2–i6. https://doi.org/10.1136/qhc.12.suppl_1.i2

Berwick, Nolan, & Whittington. (2008). The triple aim: care, health, and cost. *Health Affairs (Project Hope)*, *27*(3), 759–769. https://doi.org/10.1377/hlthaff.27.3.759

Best, A., Greenhalgh, T., Lewis, S., Saul, J. E., Carroll, S., & Bitz, J. (2012). Large-Scale Transformation in Health Care: A Realist View. *The Milbank Quarterly*, *90*(3), 421–456. https://doi.org/10.1111/j.1468-0009.2012.00670.x

Best, M., & Neuhauser, D. (2005). W Edwards Deming: Father of quality management, patient and composer. *Quality and Safety in Health Care*, *14*(4), 310–312. https://doi.org/10.1136/qshc.2005.015289

BMC Medicine. (2018). Understanding Complexity in Health Systems: International Perspectives. Retrieved from https://bmcmedicine.biomedcentral.com/articles/collections/complexity

Bodenheimer, T., & Sinsky, C. (2014). From triple to Quadruple Aim: Care of the patient requires care of the provider. *Annals of Family Medicine*, *12*(6), 573–576.

Bohmer, R. M. J., & Edmondson, A. C. (2001). Organizational Learning in Health Care. *Health Forum Journal*, *44*(2), 97–108.

Booth, B. J., Zwar, N., & Harris, M. F. (2013). Healthcare improvement as planned system change or complex responsive processes? a longitudinal case study in general practice. *BMC Family Practice*, *14*, 51. https://doi.org/10.1186/1471-2296-14-51

Borins, S. (2001). The Challenge of Innovating in Government. *PricewaterhouseCoopers Endowment for the Business of Government*, 1–48.

Bourbonnais, R., Brisson, C., Malenfant, R., & Vézina, M. (2005). Health care restructuring, work

environment, and health of nurses. *American Journal of Industrial Medicine*, *47*(1), 54–64. https://doi.org/10.1002/ajim.20104
Brainard, J., & Hunter, P. R. (2016). Do complexity-informed health interventions work? A scoping review. *Implementation Science*, *11*(1), 127. https://doi.org/10.1186/s13012-016-0492-5
Braithwaite, J., Churruca, K., Ellis, L. A., Long, J., Clay-williams, R., Damen, N., & Herkes, J. (2017). *Complexity Science in Healthcare -Aspirations, Approaches, Applications and Accomplishments: A White Paper.* Sydney, Australia.: Australian Institute of Health Innovation, Macquarie University:
Braithwaite, J., Churruca, K., Long, J. C., Ellis, L. A., & Herkes, J. (2018). When complexity science meets implementation science: a theoretical and empirical analysis of systems change, 1–14. https://doi.org/10.1186/s12916-018-1057-z
Brown, C., Arnetz, B., & Petersson, O. (2003). Downsizing within a hospital: cutting care or just costs? *Social Science & Medicine*, *57*(9), 1539–1546. https://doi.org/10.1016/S0277-9536(02)00556-7
Brownell, M., & Roos, N. (1999). Monitoring the impact of hospital downsizing on access to care and quality of care. *Medical Care*. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed4&NEWS=N&AN=10409005
Bruton, G. D., Keels, J. K., & Shook, C. L. (1996). Downsizing the firm: Answering the strategic questions. *Academy of Management Executive*, *10*(2), 38–45. https://doi.org/10.5465/AME.1996.9606161553
Burke, B. R. J. (2002). the ripple effect. *Nursing Management*, *33*(2), 41–42.
Burke, R. J. (2003). hospital restructuring stressors: Support and Nursing Staff Perceptions of Unit Functioning. *Health Care Manager*, *22*(3), 241–248.
Burke, R. J. (2005). Correlates of nursing staff survivor responses to hospital restructuring and downsizing. *The Health Care Manager*, *24*(2), 141–149. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15923926
Burns, J. P. (2001). Complexity science and leadership in healthcare. *The Journal of Nursing Administration*, *31*(10), 474–482. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11676217
Bushe, G. R., & Marshak, R. (2015). *Dialogic Organization Development* (First Edit). Berrett-Koehler Publishers, Inc.
Carroll, J. S., & Edmondson, a C. (2002). Leading organisational learning in health care. *Quality & Safety in Health Care*, *11*(1), 51–56. https://doi.org/10.1136/qhc.11.1.51
Christensen, C.M, Grossman, J.H, Hwang, J. (2009). *The Innovator's Prescription: A Disruptive Solution for Health Caree*. Harvard Business School Press.
Christiansen, T. (2012). Ten years of structural reforms in Danish healthcare. *Health Policy (Amsterdam, Netherlands)*, *106*(2), 114–119. https://doi.org/10.1016/j.healthpol.2012.03.019
Christl, B., Harris, M. F., Jayasinghe, U. W., Proudfoot, J., Taggart, J., & Tan, J. (2010). Readiness for organisational change among general practice staff. *Quality & Safety in Health Care*, *19*(5), e12. https://doi.org/10.1136/qshc.2009.033373
Coghlan, D., & Brannick, T. (2010). *Doing action research in you own organisation.* Thousand Oaks, CA, Sage.
Craik, K. J. W. (1943). *The Nature of Explanation by K.J.W. Craik*. Retrieved from https://books.google.dk/books?id=piXKXwAACAAJ
Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. a, & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science : IS*, *4*, 50. https://doi.org/10.1186/1748-5908-4-50
Danske Regioner. (2012). http://www.godtsygehusbyggeri.dk/Maal%20og%20styring.aspx.
Davis, J. A., Savage, G., & Stewart, R. T. (2003). Organizational Downsizing: A Review of Literature for Planning and Research. *Journal of Healthcare Management*. Retrieved from http://proxy.lib.odu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=9807416&site=eds-live&scope=site
Deming, W. E. (1986). *Out of the crisis*. Cambridge, Mass: Massachusetts Institute of Tecnology, Center for andvanced Engineering Study.
Dieleman, J. L., Campbell, M., Chapin, A., Eldrenkamp, E., Fan, V. Y., Haakenstad, A., … Murray, C. J. L. (2017). Articles Future and potential spending on health 2015 – 40 : development assistance for

health , and government , prepaid private , and out-of-pocket health spending in 184 countries, *6736*(17), 1–26. https://doi.org/10.1016/S0140-6736(17)30873-5
Dopson, S., FitzGerald, L., Ferlie, E., Gabbay, J., & Locock, L. (2010). No magic targets! Changing clinical practice to become more evidence based. *Health Care Management Review*, *35*(1), 2–12. https://doi.org/10.1097/HMR.0b013e3181c88e79
Dougall, D., Lewis, M., & Ross, S. (2018). Transformational change in health and care: reports from the field | The King's Fund. Retrieved from https://www.kingsfund.org.uk/publications/transformational-change-health-care
Edmondson, A. (2012). *Teaming:How Organizations Learn, Innovate, and Compete in the Knowledge Economy*. Jossey-Bass A Wiley Imprint.
Edmondson, A. C., Higgins, M., Singer, S., & Weiner, J. (2016). Understanding Psychological Safety in Health Care and Education Organizations: A Comparative Perspective. *Research in Human Development*, *13*(1), 65–83. https://doi.org/10.1080/15427609.2016.1141280
Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.2307/258557
Ellis, B., Fhea, M. A., & Citp, M. (2010). Refereed paper Complexity in practice : understanding primary care as a complex adaptive system, 135–140.
Ellström, P.-E. (2007). Knowledge Creation Through Interactive Research: a learning perspective. *HSS–07 Conference*, (1999), 1–12.
Finansministeriet. (2007). kvalitetsreformen.
Flint, D. H. (2003). Downsizing in the public sector: Metro-Toronto's hospitals. *Journal of Health Organization and Management*, *17*(6), 438–456. https://doi.org/10.1108/14777260310506597
Fulop, N. (2001). *Studying the organisation and delivery of health services Research methods*. Routledge.
Fulop, N., Protopsaltis, G., Hutchings, A., King, A., Allen, P., Normand, C., & Walters, R. (2002). Process and impact of mergers of NHS trusts: multicentre case study and management cost analysis. *BMJ (Clinical Research Ed.)*, *325*(7358), 246. https://doi.org/10.1136/bmj.325.7358.246
Glouberman, S., & Mintzberg, H. (1996). Care of Health and the Cure of Disease, Parts I:Differentiation. *Health Care Management Review*. https://doi.org/10.1097/00004010-200101000-00009
Glouberman, S., & Zimmerman, B. (2002). *Complicated and Complex Systems : What Would Successful Reform of Medicare Look Like ? Change*. https://doi.org/0-662-32778-0
Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*, *24*(2), 105–112. https://doi.org/10.1016/j.nedt.2003.10.001
Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *The Milbank Quarterly*, *82*(4), 581–629. https://doi.org/10.1111/j.0887-378X.2005.340_1.x
Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C., … Shaw, S. (2017). Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. *Journal of Medical Internet Research*, *19*(11). https://doi.org/10.2196/jmir.8775
Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C., … Shaw, S. (2018). Analysing the role of complexity in explaining the fortunes of technology programmes: Empirical application of the NASSS framework. *BMC Medicine*, *16*(1), 1–15. https://doi.org/10.1186/s12916-018-1050-6
Grenier, R. S., & Dudzinska-Przesmitzki, D. (2015). A Conceptual Model for Eliciting Mental Models Using a Composite Methodology. *Human Resource Development Review*, 1–22. https://doi.org/10.1177/1534484315575966
Grol, R. (1997). Beliefs and evidance in changing clinical practice. *British Medical Journal*, *315*(August), 418–421.
Gummesson, E. (2000). *Qualitative methods in management research,*. Thousand Oaks, CA, Sage.
Hannon, P. A., Helfrich, C. D., Chan, K. G., Allen, C. L., Hammerback, K., Kohn, M. J., … Harris, J. R. (2017). Development and pilot test of the workplace readiness questionnaire, a theory-based instrument to measure small workplaces' readiness to implement wellness programs. *American Journal of Health Promotion*, *31*(1), 67–75. https://doi.org/10.4278/ajhp.141204-QUAN-604

Hanson, H. M., Warkentin, L., Wilson, R., Sandhu, N., Slaughter, S. E., & Khadaroo, R. G. (2017). Facilitators and barriers of change toward an elder-friendly surgical environment: Perspectives of clinician stakeholder groups. *BMC Health Services Research*, *17*(1), 1–12. https://doi.org/10.1186/s12913-017-2481-z

Heifetz, R. A. (1994). *Leadership Without Easy Answers*. The Belknap Press of Harvard University Press, Cambridge, MA.

Heifetz, R. A., & Linsky, M. (2002). A Survival Guide for Leaders. *Harvard Business Review*, (June).

Heifetz, R., Crashow, A., & Linsky, M. (2009). *The Theory Behind the Practice*. *The Practice of Adaptive Leadership*. https://doi.org/10.1075/btl.59.03ber

Heimans, J., & Timms, H. (2014). Understanding "New Power." *Harvard Business Review*, *92*(12), 48–56.

Heimans, J., & Timms, H. (2018). *New Power: How Power Works in Our Hyperconnected World--and How to Make It Work for You*. DOUBLEDAY, Penguin Random House LLC, New York.

Holmes, B. J., Best, A., Davies, H., Hunter, D., Kelly, M. P., Marshall, M., & Rycroft-Malone, J. (2017). Mobilising knowledge in complex health systems: A call to action. *Evidence and Policy*, *13*(3), 539–560. https://doi.org/10.1332/174426416X14712553750311

Holt, D. T., Helfrich, C. D., Hall, C. G., & Weiner, B. J. (2010). Are you ready? How health professionals can comprehensively conceptualize readiness for change. *Journal of General Internal Medicine*, *25 Suppl 1*(3), 50–55. https://doi.org/10.1007/s11606-009-1112-8

Hovlid, E., Bukve, O., Haug, K., Aslaksen, A. B., & von Plessen, C. (2012). Sustainability of healthcare improvement: what can we learn from learning theory? *BMC Health Services Research*, *12*, 235. https://doi.org/10.1186/1472-6963-12-235

Hung, D., & Chen, P. H. (2017). Ready for change? the role of physician and staff engagement, burnout, and workplace attributes. *Journal of Ambulatory Care Management*, *40*(2), 150–157. https://doi.org/10.1097/JAC.0000000000000159

Hussey, P., Wertheimer, S., & Mehrotra, a. (2013). The Association Between Health Care Quality and Cost. *Annals of Internal Medicine*. Retrieved from http://www.rand.org/pubs/external_publications/EP51264.html

Hyde, P., Nyström, M. E., Westerlund, A., Höög, E., Millde-Luthander, C., Högberg, U., … Gabbay, R. (2013). High performance HRM: NHS employee perspectives. *BMC Health Services Research*, *12*(1), 296–311. https://doi.org/10.1186/1472-6963-12-274

Hysong, S. J., Teal, C. R., Khan, M. J., & Haidet, P. (2012). Improving quality of care through improved audit and feedback. *Implementation Science : IS*, *7*(1), 45. https://doi.org/10.1186/1748-5908-7-45

Iles, V., & Sutherland, K. (2001). Organisational Change A REVIEW FOR HEALTH CARE MANAGERS , PROFESSIONALS AND RESEARCHERS Organisational Change.

Immelt, J. R., Govindarajan, V., & Trimble, C. (2009). How GE is disrupting itself. *Harvard Business Review*, *87*(10). https://doi.org/Article

Institute for Healthcare Improvement. (2017). *IHI's QI Essentials Toolkit*. *Whitepaper IHI*.

Institute of Medicine. (2001). *Crossing the Quality Chasm: A new Health System for the 21 st Century*. Retrieved from http://doi.wiley.com/10.1111/1468-0009.00206

Institute of Medicine. (2012). *Best Care at Lower Cost*. https://doi.org/10.17226/13444

Jarvis, C., Gulati, a., McCririck, V., & Simpson, P. (2012). Leadership Matters: Tensions in Evaluating Leadership Development. *Advances in Developing Human Resources*, *15*(1), 27–45. https://doi.org/10.1177/1523422312467138

Johnson-Laird, P. (1983). 8 The history of mental models. *Psychology of Reasoning: Theoretical and …*. Retrieved from http://books.google.com/books?hl=en&lr=&id=B315AgAAQBAJ&oi=fnd&pg=PA179&dq=the+history+mental+models&ots=npKOxnTsZt&sig=b0jXIHzK742m67e4q_IVXtWgd3Q

Johnson, J. K., Farnan, J. M., Barach, P., Hesselink, G., Wollersheim, H., Pijnenborg, L., … Arora, V. M. (2012). Searching for the missing pieces between the hospital and primary care: mapping the patient process during care transitions. *BMJ Quality & Safety*, *21 Suppl 1*(November), i97-105. https://doi.org/10.1136/bmjqs-2012-001215

Kegan, R., & Lahey, L. (2001). The Real Reason people won´t change. *Harvard Business Review*.

Kempermann, G. (2017). Cynefin as reference framework to facilitate insight and decision-making in complex contexts of biomedical research. *Frontiers in Neuroscience*, *11*(NOV), 1–8.

https://doi.org/10.3389/fnins.2017.00634
Kernick, D. (2006). Wanted--new methodologies for health service research. Is complexity theory the answer? *Family Practice*, *23*(3), 385–390. https://doi.org/10.1093/fampra/cml011
Kim, D. H. (1993). The link between Individual and organisational Learning. *Sloan Management Review*, *35*(1), 37–50.
Kotter, J. P. (1996). *Leading change*. Boston, Mass.: Harvard Business School Press.
Laloux, F. (2014). *Reinventing organizations:A Guide to Creating Organizations Inspired by the Next Stage of Human Consciousness*. NELSON PARKER.
Langley, G., Nolan, K., Nolan, T., Norman, C., & Provost, L. (1996). *The improvement guide : a practical approach to enhancing organizational performance*. (J.-B. Publishers, Ed.) (1st ed.). San Francisco:
Leatt, P., Baker, G. R., Halverson, P. K., & Aird, C. (1997). Downsizing, reengineering, and restructuring: long-term implications for healthcare organizations. *Frontiers of Health Services Management*, *13*(4), 3-37; discussion 52-4. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10167281
Leonardi, P. M. (2011). Innovation Blindness: Culture, Frames, and Cross-Boundary Problem Construction in the Development of New Technology Concepts. *Organization Science*, *22*(2), 347–369. https://doi.org/10.1287/orsc.1100.0529
March, J. (1991). Exploration and exploitation in organisational learning. *Organization Science*, *2*(1).
Martin, C. M., & Félix-Bortolotti, M. (2010). W(h)ither complexity? the emperor's new toolkit? or elucidating the evolution of health systems knowledge? *Journal of Evaluation in Clinical Practice*, *16*(3), 415–420. https://doi.org/10.1111/j.1365-2753.2010.01461.x
Maslach, C. Jackson, S. (1981). The Measurement of Experienced Burnout. *Journal of Occupational Behaviour*, *2*(April 1980), 99–113. https://doi.org/10.1002/job.4030020205
May. (2007). *The Elegant Solution*. London: Simon and Schuster UK Ltd.
Mazzocato, P., Savage, C., Brommels, M., Aronsson, H., & Thor, J. (2010). Lean thinking in healthcare: a realist review of the literature. *Quality & Safety in Health Care*, *19*(5), 376–382. https://doi.org/10.1136/qshc.2009.037986
Mazzocato, P., Stenfors-Hayes, T., von Thiele Schwarz, U., Hasson, H., & Nyström, M. E. (2016). Kaizen practice in healthcare: a qualitative analysis of hospital employees' suggestions for improvement. *BMJ Open*, *6*(7), e012256. https://doi.org/10.1136/bmjopen-2016-012256
Mazzocato, P., Thor, J., Bäckman, U., Brommels, M., Carlsson, J., Jonsson, F., … Savage, C. (2014). Complexity complicates lean: lessons from seven emergency services. *Journal of Health Organization and Management*, *28*(2), 266–288. https://doi.org/10.1108/JHOM-03-2013-0060
Mellahi, K., & Wilkinson, A. (2010). Slash and burn or nip and tuck? Downsizing, innovation and human resources. *International Journal of Human Resource Management*, *21*(13), 2291–2305. https://doi.org/10.1080/09585192.2010.516584
Meyer, J. P., Stanley, D. J., Herscovitch, L., & Topolnytsky, L. (2002). Affective, Continuance, and Normative Commitment to the Organization: A Meta-analysis of Antecedents, Correlates, and Consequences. *Journal of Vocational Behavior*, *61*(1), 20–52. https://doi.org/10.1006/jvbe.2001.1842
Mick, S., & Wise, C. (1996). Downsizing and the Financiel Performance in Rural Hospitals. *Health Care Management Review*, *21*(2), 16–25.
Ministeriet for Sundhed og Forebyggelse Slotsholmsgade 10-12 1216 København K. (2008). *Regeringens ekspertpanel The Government's expert panel. Regionernes investerings- og sygehusplaner - screening og vurdering The regions', investment- and hospital plans - screening and evaluation*. Copenhagen.
Morcke, A. M., & Eika, B. (2009). Medical faculty and curriculum design1? 'No, no, it's like this: You give your lectures ….' *Medical Teacher*, *31*(7), 642–648. https://doi.org/10.1080/01421590802216233
Mowles, C. (2010). Successful or not? Evidence, emergence, and development management. *Development in Practice*, *20*(7), 757–770. https://doi.org/10.1080/09614524.2010.508110
Nawaz, H., Edmondson, A., Tzeng, T., Saleh, J., Bozic, K., & Saleh, K. (2014). Teaming: An approach to the growing complexities in health care. *The Journal of Bone and Joint Surgery*, *184*, 1–7. https://doi.org/10.2106/JBJS.M.01268

Nicolay, C. R., Purkayastha, S., Greenhalgh, A., Benn, J., Chaturvedi, S., Phillips, N., & Darzi, A. (2012). Systematic review of the application of quality improvement methodologies from the manufacturing industry to surgical healthcare. *British Journal of Surgery*, *99*(3), 324–335. https://doi.org/10.1002/bjs.7803

Nonaka, I., & Tekeuchi, H. (1995). *The knowledge-creating company*. New York: Oxford University Press.

Nordang, K., Hall-Lord, M.-L., & Farup, P. G. (2010). Burnout in health-care professionals during reorganizations and downsizing. A cohort study in nurses. *BMC Nursing*, *9*, 8. https://doi.org/10.1186/1472-6955-9-8

Nyström, M. E., Westerlund, A., Höög, E., Millde-Luthander, C., Högberg, U., & Grunewald, C. (2012). Healthcare system intervention for prevention of birth injuries – process evaluation of self-assessment, peer review, feedback and agreement for change. *BMC Health Services Research*, *12*, 274. https://doi.org/10.1186/1472-6963-12-274

Omachonu, V., & Einspruch, N. (2010). Innovation in healthcare delivery systems: A conceptual framework. *... Journal: The Public Sector Innovation ...*, *15*(1), 1–20. Retrieved from http://xa.yimg.com/kq/groups/22136350/406689753/name/Healthcare+innovation.pdf

Ovretveit, J. (2009). *Does improving quality save money ? A review of evidence of which improvements to quality reduce costs to health service providers*. *London: the health Foundtion* (Vol. 339). https://doi.org/10.1136/bmj.b3678

Palm, K., Lilja, J., & Wiklund, H. (2016). The challenge of integrating innovation and quality management practice. *Total Quality Management & Business Excellence*, *27*(1–2), 34–47. https://doi.org/10.1080/14783363.2014.939841

Panagioti, M., Geraghty, K., Johnson, J., Zhou, A., Panagopoulou, E., Chew-Graham, C., … Esmail, A. (2018). Association Between Physician Burnout and Patient Safety, Professionalism, and Patient Satisfaction: A Systematic Review and Meta-analysis. *JAMA Internal Medicine*, 1–14. https://doi.org/10.1001/JAMAINTERNMED.2018.3713

Pawson, R., & Tilley, N. (1997). *Realistic evaluation*. London: SAGE.

Pettigrew, A. M., & Whipp, R. (1993). *Managing Change for Competitive Success*. Oxford: Marston Book Services, Ltd.

Plsek, P. E., & Greenhalgh, T. (2001). Complexity science: The challenge of complexity in health care. *BMJ (Clinical Research Ed.)*, *323*(7313), 625–628. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1121189&tool=pmcentrez&rendertype=abstract

Plsek, P. E., & Wilson, T. (2001). Complexity, leadership, and management in healthcare organisations. *BMJ*, *323*(7315), 746–749.

Porter, M. E. (2010). What Is Value in Health Care. *New England Journal of Medicine*, 2012–2014. https://doi.org/10.1056/NEJMp1415160

Ramaswamy, R., Reed, J., Livesley, N., Boguslavsky, V., Garcia-Elorrio, E., Sax, S., … Parry, G. (2018). Unpacking the black box of improvement. *International Journal for Quality in Health Care*, *30*(suppl_1), 15–19. https://doi.org/10.1093/intqhc/mzy009

Regeringens ekspertpanel vedr. sygehusinvesteringer. (2008). *Regionernes investerings- og sygehusplaner. Screening og vurdering*.

Reid, I. (2002). Let them eat complexity: the emperor´s new toolkit. *BMJ (Clinical Research Ed.)*, *324*(7330), 171. https://doi.org/10.1136/bmj.324.7330.167

Rouse, W. (1986). On looking into the black box: Prospects and limits in the search for mental models. *Psychological Bulletin*. Retrieved from http://psycnet.apa.org/journals/bul/100/3/349/

Rousseau, D. M. (1997). Organizational behavior in the new organizational era. *Annual Review of Psychology*, *48*, 515–546. https://doi.org/10.1146/annurev.psych.48.1.515

Rudkjøbing, A., Olejaz, M., Birk, H. O., Nielsen, A. J., Hernández-quevedo, C., & Published, A. (2012). Integrated care : a Danish perspective. *BMJ*, *345*, 4451. https://doi.org/10.1136/bmj.e4451

Sanders, K. A., Wolcott, M. D., McLaughlin, J. E., D'Ostroph, A., Shea, C. M., & Pinelli, N. R. (2017). Organizational readiness for change: Preceptor perceptions regarding early immersion of student pharmacists in health-system practice. *Research in Social and Administrative Pharmacy*. https://doi.org/10.1016/j.sapharm.2017.03.004

Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. Basic Books.

Schön, D. A. (1991). *Educating the reflective practitioner*. Jossey-Bass Inc., Publishers.
Senge, P. . (1990). *The Fifth Discipline: The Art & Practice of The Learning Organization*. Currency and Doubleday.
Shea, C. M., Jacobs, S. R., Esserman, D. A., Bruce, K., & Weiner, B. J. (2014). Organizational readiness for implementing change : a psychometric assessment of a new measure. *Implementation Science*, *9*(7). https://doi.org/10.1186/1748-5908-9-7
Simpson, P. (2007). Organizing in the mist : a case study in leadership and complexity, *28*(5), 465–482. https://doi.org/10.1108/01437730710761751
Simpson, P. (2012). Complexity and change management: analyzing church leaders' narratives. *Journal of Organizational Change Management*, *25*(2), 283–296. https://doi.org/10.1108/09534811211213955
Simpson, P., French, R., & Harvey, C. E. (2002). Leadership and negative capability. *Human Relations*, *55*(10), 1209–1226. https://doi.org/10.1177/0018726702055010081
Sitkin, S. B., See, K. E., Miller, C. C., Lawless, M. W., & Carton, A. M. (2011). The Paradox of Stretch Goals: Organizations in Pursuit of the Seemingly Impossible. *Academy of Management Review*, *36*(3), 544–566. https://doi.org/10.5465/AMR.2011.61031811
Snowden, D., & Boone, M. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*, (November).
Stacey, R. (2001). *Complex Responsive Processes in Organizations: Learning and Knowledge Creation (Complexity and Emergence in Organizations)*. Routledge.
Stacey, R. D. (2011). Strategic Management and Organisational Dynamics: The challenge of complexity to ways of thinking about organisations (6th Edition).
Sturmberg, J. P., Martin, C. M., & Katerndahl, D. A. (2014). Systems and complexity thinking in the general practice literature: An integrative, historical narrative review. *Annals of Family Medicine*, *12*(1), 66–74. https://doi.org/10.1370/afm.1593
Sverke, M., Hellgren, J., Näswall, K., Göransson, S., & Öhrming, J. (2008). Employee participation in organizational change: Investigating the effects of proactive vs. reactive implementation of downsizing in Swedish hospitals. *Zeitschrift Fur Personalforschung*, *22*(2), 111–129.
Swensen, S., Pugh, M., McMullan, C., & Kabcenell, A. (2013). High-Impact Leadership : Improve Care, Improve the Health of Populations, and Reduce Costs. *IHI White Paper. Cambridge, Massachusetts: Institute for Healthcare Improvement; 2013. (Available at Ihi.Org*.
Tataw, D. B. (2011). Provider perceptions of the social work environment and the state of pediatric care in a downsized urban public academic medical center. *Journal of Evidence-Based Social Work*, *8*(3), 275–293. https://doi.org/10.1080/15433714.2011.528728
Taylor, M. J., McNicholas, C., Nicolay, C., Darzi, A., Bell, D., & Reed, J. E. (2014). Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. *BMJ Quality & Safety*, *23*(4), 290–298. https://doi.org/10.1136/bmjqs-2013-001862
Thompson, D. S., Fazio, X., Kustra, E., Patrick, L., & Stanley, D. (2016). Scoping review of complexity theory in health services research. *BMC Health Services Research*, *16*(1), 87. https://doi.org/10.1186/s12913-016-1343-4
Van Beurden, E. K., Kia, A. M., Zask, A., Dietrich, U., & Rose, L. (2013). Making sense in a complex landscape: How the cynefin framework from complex adaptive systems theory can inform health promotion practice. *Health Promotion International*, *28*(1), 73–83. https://doi.org/10.1093/heapro/dar089
Voss, C., Tsikriktsis, N., & Frohlich, M. (2002). Case research in operations management. *International Journal of Operations & Production Management*, *22*(2), 195–219. https://doi.org/10.1108/01443570210414329
Waldrop, M. (1992). *Complexity: The emerging science at the edge of order and chaos*. Simon and Schuster, inc.
Wallace, J. E., Lemaire, J. B., & Ghali, W. a. (2009). Physician wellness: a missing quality indicator. *The Lancet*, *374*, 1714–1721. https://doi.org/10.1016/S0140-6736(09)61424-0
Walshe, K. (2007). Understanding what works--and why--in quality improvement: The need for theory-driven evaluation. *Int J Qual Health Care*, *19*(2), 57–59.
Walshe, K. (2009). Pseudoinnovation: The development and spread of healthcare quality improvement methodologies. *International Journal for Quality in Health Care*, *21*(3), 153–159.

https://doi.org/10.1093/intqhc/mzp012
Weiner, B. J. (2009). A theory of organizational readiness for change. *Implementation Science : IS*, *4*, 67. https://doi.org/10.1186/1748-5908-4-67
Weiner, B. J., Amick, H., & Lee, S.-Y. D. (2008). Conceptualization and measurement of organizational readiness for change: a review of the literature in health services research and other fields. *Medical Care Research and Review : MCRR*, *65*(4), 379–436. https://doi.org/10.1177/1077558708317802
Wells, S., Tamir, O., Gray, J., Naidoo, D., Bekhit, M., & Goldmann, D. (2018). Are quality improvement collaboratives effective? A systematic review. *BMJ Quality and Safety*, *27*(3), 226–240. https://doi.org/10.1136/bmjqs-2017-006926
Whittington, J., & Nolan, K. (2015). Pursuing the Triple Aim: The First 7 Years. *The Milbank Quarterly*, *93*(2), 263–300.
Yin, R. K. (2009). *Case Study Research: Design and Methods*. Thousands Oak: Sage Publications.
Zhou, H., Zhang, S., Zhang, W., Wang, F., Zhong, Y., Gu, L., … Tian, D. (2015). Evaluation and mechanism for outcomes exploration of providing public health care in contract service in Rural China: a multiple-case study with complex adaptive systems design. *BMC Public Health*, *15*(1), 1–12. https://doi.org/10.1186/s12889-015-1540-9
Zimmerman, B., Lindberg, C., & Plsek, P. E. (1998). *Edgeware: Lessons From Complexity Science for Health Care Leaders* (2nd ed.). United States of America: Plexus Institute.
Øvretveit, J. (2012). Implementing organisation and management innovations in Swedish healthcare: Lessons from a comparison of 12 cases. *Journal of Health Organisation and Managementand Management*, *26*(2), 237–257. https://doi.org/10.1108/14777261211230790

10 APPENDIX

10.1 APPENDIX 1: INTERVIEW GUIDE STUDY I AND IV

Introduktion

Tak, fordi du har sagt ja til at deltage i interviewet.

AUH er i disse år i gang med store organisatoriske forandringer, for at blive det nye ”AUH under fælles tag”, der indebærer nybyggeri, fusion af afdelinger og effektivisering af driften. Tilpasningen til ”AUH under fælles tag” påvirker også afd. Y, der skal finde løsninger på hvorledes patienterne kan behandles indenfor de nye fysiske -og organisatoriske rammer, hvor sengeantal, budget og personale forventes reduceret samtidig med at høj kvalitet samt produktivitet forventes opretholdt.

I mit PhD-projekt, der er et samarbejde mellem Medical Management Centret på Karolinska Instituttet i Stockholm og Klinisk Institut på Aarhus Universitet, skal jeg følge denne forandringsproces og indsamle data gennem interview med personale og ledelse, observationer, dokumentgennemgang og en spørgeskema undersøgelse.

Formålet med forskningsprojektet er, at skabe ny viden om medarbejderinddragelse, udvikling af patientforløb og forandringsledelse på afdelingsniveau i forbindelse med etablering af ”supersygehuse”.,

Denne viden kan potentielt øge forståelsen af de komplekse faktorer, der påvirker udviklingen af det moderne sundhedsvæsen tæt på klinikken, samt medvirke til at skabe bedre planlægning af forandringstiltag og inddragelse af medarbejdere, både i forhold til de akutelle og fremtidige udfordringer for de nye ”supersygehuse”. Formålet med interviewet er at belyse afdeling Y´s forandringsproces fra forskellige perspekter. I interviewet er det din personlige opfattelse der er vigtig og der findes ikke ”rigtig eller forkerte” svar.

Interviewet varer ca. 1 time og din deltagelse er frivillig. Du kan på ethvert tidspunkt afbryde interviewet undervejs. Data vil blive behandles fortroligt og anonymt, således, at dit navn ikke vil optræde i analysen eller præsentation af undersøgelsesresultater. Mine forskningskollegaer på Karolinska Instituttet og jeg vil have adgang til rå data, men rå data vil ikke blive tilgængelige for andre personer, ej heller ledelsen på afd. Y.

Du vil blive tilsendt en kopi af resultaterne af interviewundersøgelsen, så du kan gennemlæse og godkende de data som tænkes at indgå i den endelige artikel. For at lette bearbejdningen og analysen af interviewet skal interviewet optages og transskriberes. Herefter vil optagelsen blive slette

Interviewguide (medarbejdere og ledelse)

Hvordan forstår personale og ledelse nødvendigheden af de forandringer, der skal ske for at afd. Y tilpasses "AUH under fælles tag"?

Indledende spørgsmål:

1) Kan du starte med at fortælle kort:
   a) Hvem du er? (din alder?)
   b) Hvad din profession er og hvilken søjle (gyn/obs) du er tilknyttet?
   c) Hvor lang tid du har arbejdet på afd. Y? Fuld tid/deltid og hvor lang er din samlede professionelle erfaring?
   d) Hvad dine arbejdsopgaver/ansvarsområder er?

Understanding of the organizational change (Purpose, objectives and content) (commitment and efficacy): (ca 10 min)

AUH er i disse år i gang med en stor omstillings -og forandringsproces for at blive det nye "AUH Under fælles tag", der indebærer nybyggeri, fusion af afdelinger og effektivisering af driften og samtidig skal der leveres patientbehandling af høj kvalitet og en uændret produktivitet.

2) Hvad tænker du generelt om både at skulle effektivisere driften og samtidig levere behandling af høj kvalitet?
3) Kan du med dine egne ord beskrive afdelingens målsætning?
   a) Hvis du tænker på dit eget arbejde, kan du beskrive hvad der gør det meningsfuldt og skaber værdi for dig?
4) Kan du beskrive hvad forandringsprocessen indebærer for afd. Y ?
   a) Helt konkret (hvis det ikke besvares?)
   b) Hvad er motivet for ændringerne af afd. Y? *(C)*
   c) Er rammen for ændringerne på afdelingen fastlagt? *(E +context)*
      i) Hvordan? Af hvem? Eksternt/Internt?
      ii) I hvilken sammenhæng/forum er det blevet besluttet?
5) Kan du beskrive hvad du mener ligger til grund for forandringsprocessen på afd. Y ?
   a) Hvad er målet for ændringerne på afdelingen? (C)
   b) Hvilke værdier og principper er grundlæggende for forandringsprocessen?(C)
   c) Bruges der en særlig model eller strategi for forandringsprocessen? (E)
   d) Hvordan inddrages personalet ? (C+E)
   e) Hvordan er du selv involveret?
   f) Hvordan er andre, udover afdelingens personale, involveret?
   g) Staff: Hvis du skulle lede forandringsprocessen, hvordan ville du inddrage personalet?
   h) Chef: hvordan synes du det går med at involver personalet – er der noget du tænker med fordel kunne gøres anderledes?

Summarize this section

Content – (i.e., what is being changed) (ca. 15 min)

6) Kan du beskrive hvordan forandringsprocessen påvirker afdelingens aktiviteter (både aktuelt og på længere sigt) (Ydelser afd. leverer)
   a) Kan du give et eksempel på hvordan afdelings aktiviteter er påvirket?
   b) Hvilke organisatoriske forandringer tænker du bliver nødvendige? *(E)*
7) Hvordan forventer du, at dit daglige arbejde forandres i denne omstillingsproces? (positivt/negativt)
   a) Hvad tænker du bliver den største forandring?
   b) Kan du give et eksempel på hvordan dit daglige arbejde er forandret**?**
8) Hvordan forventer du, at patienternes kontakt til afdelingen bliver berørt af denne forandringsproces? (positivt/negative)?
   a) Hvordan vil det påvirke patienternes oplevelse og tilfredshed med deres undersøgelse og behandling på afdelingen?
   b) Vil der være patienter, der i særlig grad vil mærke forandringer?
   c) Hvis ja, hvordan håndteres udfordringer med disse patienter i dag?
   d) Kan du give et eksempel på hvordan patienternes kontakt til afdelingen er berørt aktuelt?
   e) Har du et bud på, hvordan patienterne får oplevelsen af et godt patientforløb på afdelingen i fremtiden?

Process/Context – (i.e., how the change is being implemented) 15-20 min

9) Hvordan har forandringsprocessen forløbet indtil nu?
   a) Forklare på en tidslinje (tegn evt. selv linjen).
   b) Hvordan startede forandringen på afdelingen?
   c) Hvilke personer/aktører har været aktivt involveret i forandringsprocessen?
   d) Hvordan forløber den fremadrettet? Kan du se hvor forandringsprocessen fører hen?
   e) Stemmer målet for forandringsprocessen overens med afdelingens målsætning?
10) Nu har du beskrevet tidslinjen, er der særlige omstændigheder /faktorer der har påvirket forandringsprocessen undervejs?

Hvis ja:
   a) Hvorfor ændre planerne sig?
   b) Opstod nye indsigter undervejs?
   c) Har magt, politik(magtspil), modstand, indflydelse?
   d) Konteksten – EPJ, tid, ressourcer, lederskift mv.
   e) På forskellige niveauer: afdelingen, sygehuset , regionen (almen praksis) og nationalt?
   f) Hvordan er samspillet mellem de forskellige niveauer over tid?

Summarize timeline.

11) Hvad fungere godt i den igangværende forandringsproces?
   a) Er der noget der med fordel kunne gøres anderledes?
   b) Hvis du skulle lede denne forandringsproces, hvad ville du så gøre og hvorfor? (Not for management)

12) Hvis du kigger ud i fremtiden – hvad er afdelings største udfordring ved denne forandringsproces?
    a) Hvad er den største mulighed?

Context – (i.e., circumstances under which the change is occurring) (6-7min)

13) Hvordan er afdelings Y´s betingelser for forandring i forhold til andre afdelinger?
    a) Andre gyn/obs afdelinger? Andre afd. På AUH? Eksempelvis i forhold til støtte, modstand, ressourcer, kompetencer, erfaringer fra tidligere forandringsprocesser, kultur?
    b) På hvilke måder påvirker betingelserne forandringsprocessen?
    c) Er der forskel på gynækologisk og obstetrisk søjle?
14) Opsummering - hvilke faktorer/omstændigheder ser du støtter eller forhindre succesfuld tilpasningen til "AUH under fælles tag"
    a) Finder der nøglefaktorer der støtter eller forhindre forandringsprocessen. Kultur, ledelse, engageret personale?

Outcome – (5-10 min)

15) Forventer du, at forandringerne vil påvirke afdelingen mere generelt? AUH?
    a) Kvaliteten af behandling og patientsikkerhed? *(C)*
    b) Arbejdsmiljøet? *(C)*
    c) Forskning, udvikling og uddannelse? *(C*)
16) Hvordan evalueres denne omstilling til AUH under fælles tag"?(opfølgning, hvem, hvornår og hvordan?)
    a) Hvis du skulle evaluere forandringsprocessen, hvad ville du måle på?
17) Hvilke resultater (positive/negative) forventer du af forandringsprocessen?
    a) Har du allerede observeret resultater for patienter, personale eller organisationen**?**
18) Lad os vende tilbage til det første spørgsmål " om både at skulle effektivisere driften og samtidig levere behandling af høj kvalitet og en god oplevelse for patienterne"
    a) Ser du nogle nye måder at håndtere dette?
19) Er der noget jeg mangler at spørge til - eller som du gerne vil tilføje?
20) Er der andre du vil foreslå, at jeg taler med?
21) Hvordan har du oplevet at blive interviewet om dette emne?

Tak for din deltagelse

10.2 APPENDIX 2: ANALYSIS STUDY IV

Abbreviations

OB: Obstetrics

GYN: Gynecology

OB-org: Obstetrical section – Organizational level

GYN-org: Gynecological section – Organizational level

AUH: Aarhus University Hospital

PH: Patient Hotel

ABC: After Birth Clinic

MC: Midwife Clinic

GP: General Practitioner

OOC: Obstetrical Outpatient Clinic

GOC: Gynecological Outpatient Clinic

EOC: Emergency Obstetrical Clinic

LOS: Length of Stay

BP: blood pressure

PE: Preeclampsia

EGC: Emergency Gynecological Clinic

FMU: Fetal Medicine Unit

DSU: Day Surgical Unit

PW: Pregnancy Ward

OB/GYN: Obstetrics and Gynecology

OR: Operating Room

CTG: Cardiotocography

MRI: Magnetic resonance imaging

Ped. Department: Pediatric Department.

Abd. Surgery: Abdominal Surgery

GA: General Anesthesia

GI-function: Gastro Intestinal function

KAD: Kateter à demeur

GBS: Group B Streptococcus

FAQ: Frequently Asked Questions

OHSS: Ovarian Hyperstimulation Syndrom

ANALYSIS

Obstetrics

NUMBER	ID NUMBER	DESCRIPTION/SUMMARY OF ANALYSIS	CONTEXTUAL SITUATION	PROBLEM DEFINITION	RESPONSE	PRIMARY LOCUS OF RESPONSIBILITY FOR THE WORK	KIND OF WORK	DECISION-MAKING (WORK) PROCESS
1	1 OB Trauma in pregnancy	Simple. Clear problem definition – Avoid unnecessary admissions. Analysis of the pathway did not lead to new responses as the group decided to adopt a technical solution, i.e. adhere to a new regional guideline that categorized trauma into high or low risk, with only high risk needing a 24-hour observation period., which matched the result of the analysis.	Simple	Clear	Clear	? Managers	Technical	Analyze Respond Categorize Respond
2	2 OB Post partum hemorrhage	Simple. Clear problem definition – Avoid unnecessary admissions. Clear causality in the literature – analysis with no supporting evidence for admission at a certain safety limit. This challenged the “better safe that sorry” cultural attitude among staff. Changed safety limits for admission in the department guidelines based on a new categorization of the amount of bleeding that should lead to admission based on literature.	Simple	Clear	Requires learning (Complicated)	Staff supported by managers	Adaptive and then technical	Analyze Respond Categorize Respond

3	3 OB Lactation after birth	Simple, clear problem definition. – Avoid unnecessary admissions by more flexibility in labor ward (stay a few more hours) and collaboration with ABC. Multiparous with previous successful breastfeeding could discharge directly from labor ward – other could be care for in the PH with support from ABC, thus avoid admission to the maternity ward.	Simple	Clear	Requires learning	Staff supported by managers	Adaptive and then technical	Analyze Respond Analyze **Probe** (walking nurse/ABC)
4	4 OB Gemelli (Non-identical)	Simple. Clear problem definition – too many outpatient visits. Development of response and work process were complicated as a mapping (analysis) of all the visits was made and which, when analyzed, revealed that double-visits were not needed. These were then removed. Before this analysis, a specialist gemelli midwife performing group-consultations had begun in the MC – that further made a reduction in visits possible.	Simple	Clear	Required learning (trough cross sectional analysis)	Staff supported by managers	Adaptive then technical	Analyze Respond **Categorize** Respond
5	5 OB Fetal malformation	Simple – Clear problem definition – too many unnecessary outpatient visits in AUH. Redistribution of activities to regional departments based on clear problem definition, simple context, clear solution, technical work based on categorization of diagnostic	Simple	Clear	Required learning	Staff supported by managers	Adaptive and then technical	Analyze Respond Categorize Respond

		work related to need for specialist competence. Furthermore, a categorization of patients/fetus with heart disease was conducted so that fetal medical specialist examined that only patient that needed specialist ultrasound.						
6	6 OB Anal Sphincter injury	Simple situation with a clear problem definition. Unnecessary admissions, without supporting evidence. The solution was technical but informed by literature review and experiences from other departments and involved more collaboration between ABC, physiotherapy and labor-ward.	Simple	Clear	**Clear** – only because the analysis had already been conducted before the camps	(Staff supported) by managers	Technical (Required collaboration and coordination) –the analysis had already been conducted. = Adaptive	Categorize Respond
7	7 OB Children in pediatric care	Simple situations with a clear problem, unnecessary admission of mother – the response included an expanded collaboration with neo and PH – so that children in pediatric care and waiting for diagnostic test could be admitted in pediatric department or PH – Maternity follow up can be done in the ABC instead of during admission in the maternity ward. Tested a "solution" using a walking nurse.	Simple	Clear	Required learning	Staff supported by managers	Adaptive and then technical	Analyze Respond Categorize Probe
8	8 OB Children with infection	Simple situation with a clear problem definition (logistics) –expanded collaboration with PH – ABC –	Simple	Clear	Required learning	Staff supported by managers	Adaptive and then technical	Analyze Respond Probe

		Antibiotics- treatment in PH – cared for by "walking nurse" and parents.						
9	9 OB Prurigo /intrahepatic cholestasis (ICP)	The problem was defined as clear and simple. The context was simple. The response, while it required some coordination, could have been simple since it did not take a long time to develop, however it did require some coordination of activities. The rewriting of referral guidelines was quick, but the review of the new guidelines and the spread of the information took a longer amount of time. The patient group was categorized as not being necessary to be seen acutely, which guided subsequent response development, however, this was arrived at after a pathway analysis, which suggests that a complicated work process was used to solve a simple problem. Staff and middle managers shared the locus of responsibility developed the solution together without much discussion department management.	Simple	Clear	Clear	Staff supported by managers	Technical and adaptive	Analyze Respond **Categorize** Respond
10	10 OB Neonatal Weight loss	Simple situation with a clear problem definition (to many unnecessary admissions) – the response was developed through a prototyping process. And included a collab-	Simple	Clear	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Analyze Sense Respond

		oration between neonatologist, maternity nurse and ABC, that made individual plans – not based on 10% cut off but an individual evaluation of the baby and family.						
11	11 OB Breech presentation	Simple situation with a clear problem definition – the MC could not diagnose if a baby was a breech presentation because they had no ultrasound and training. The response was to get have ultrasound available in the MC and train a midwife coordinator to scan breech or no-breech.	Simple	Clear	Required learning	Staff supported by management	Adaptive and technical	Analyze Respond Probe Respond
12	12 OB Children with jaundice	Simple situation with a clear problem definition – the care of children with jaundice could only be handled in the maternity ward due to lack of nursing competences in other facilities. The pathway was analyzed and the light mattress was tested in the PH and finally implemented in home care also, allowing babies to receive light treatment for jaundice at home or in PH and be followed by ABC-nurse.	Simple	Clear	Required learning	Staff supported by management	Adaptive then technical	Analyze Respond Probe Respond
13	13 OB Premature Children	Simple situation with a clear problem definition. Premature heating mattress at home allows premature to go home earlier, this new ap-	Simple	Clear	Required learning	Staff supported by management	Adaptive and technical	Analyze Respond Probe Sense Respond

		proach was tested in collaboration with the pediatric department.						
14	14 OB Diabetes in pregnancy	A complicated situation with several aspects (i.e. better safe than sorry, correct and changed risk stratification) and a clear problem definition – avoid unnecessary admissions. Clear causality, though not everyone can see it, guidelines were not followed because of uncertainty and worry of staff – better safe than sorry (defensive medicine). The response was to review the literature and the categorize patients. Guidelines were changed with new risk stratification and an emphasis on that staff follow department guidelines when admitting patients.	Complicated	Clear	Required learning	Staff supported by management	Adaptive and technical	Analyze Respond Categorize Respond
15	15 OB Bleeding in Pregnancy	A complicated situation with several aspects (i.e. better safe than sorry, correct diagnosis before admission). A working group analyzed several care pathways and identified a clear problem of too many unnecessary admissions. They responded by reviewing the literature and based on that improved the diagnostic process before admission so that staff felt able to address the tendency for admissions to be “better	Complicated	Clear	Required learning	Staff supported by management	Adaptive and technical	Analyze Respond Categorize Respond

		safe than sorry" i.e. defensive medicine. Observation reduced from 48 to 24 hours after fresh bleeding						
16	16 OB Preeclampsia (mild)	Complicated situation with a clear problem definition. Too many unnecessary visits of preeclampsia patients in the EOC. The response was to develop a "solutions shop" in the MC using BP monitoring and to change guidelines for follow-up in pregnancy clinic or to hand over the follow up process to a GP or the MC. In the case of induction – monitoring in PH is possible. The response involved that the visitation guideline was changed – high BP should be verified by coordination midwife before referral and follow-up of mild PE can be done in midwife clinic or by GP –when referred to OOC then patient are seen by a OB/GYN resident	Complicated	Clear	Required learning	Staff supported by managers	Adaptive and Technical	Analyze Respond Categorize Probe Sense Respond
17	17 OB Vacuum assisted birth	Complicated situation with a clear problem definition – a technical approach was used to analyze patient data and reject a simple solution (re-categorization of all patients) and learn about causality (analysis of admission data) and therefore adopt a response that required each midwife to tailor an individual plan for the patient (baby).	Complicated	Clear	Require learning	Staff supported by managers	Adaptive	Analyze (Pathway and admission-data) Respond Analyze Probe Sense Respond

		This required increased flexibility in labor ward and collaboration with ABC, PH, and maternity ward.						
18	18 OB Neonatal hypoglycemia	Complicated situation a clear problem definition, that required improved collaboration and coordination to develop a response – To avoid unnecessary admissions by improving flexibility in labor ward (stay a few hours more) and collaboration with maternity ward, ABC and PH	Complicated	Clear	Required learning	Staff supported by managers	Adaptive and technical	Analyze Respond Analyze Probe Sense Respond
19	19 OB Vulnerable pregnant	Complicated situation with a clear problem definition, the current approach does not take in to account the varying need of patients and therefore a more flexible approach was needed to avoid unnecessary admissions. Individual plans instead of a fixed 5 days observation period – home visit team to conduct network meetings that reduces waiting time under admission. Possible to stay in PH and parent wing of Ped. Department also.	Complicated	Clear	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond
20	20 OB Cesarean section CS	Complicated situation with a clear problem definition, too long length of stay. The pathway was analyzed and changes were made in pain-medication, improving recovery of GI function and guidelines for discharge. Involving anesthesiologist –	Complicated	Clear	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond

		and that prophylactic antibiotics could be given in PH						
21	21 OB Urine retention after birth	Complicated problem definition, it appeared clear at first but through analysis and discussions between nurses and midwives, the clarity of the problem changed to be rather prober pain treatment, instead of unnecessary admission of patients with KAD. If the patient really had urine retention she could be admitted to PH or go home with KAD with support from ABC – change admission guidelines after complicated birth.	Complicated problem	Clear Wasn't clear for everyone	Required learning	Staff supported by managers	Adaptive	**Analyze** Respond Probe Sense Respond
22	22 OB Group B Streptococcal (GBS) observation/ **Early onset Group B strep disease**	Complicated situation with a clear problem definition, to avoid unnecessary antibiotic treatment and admission of mothers and children that was not at risk of early onset Group B strep disease (Pregnant woman not colonized with GBS). Clear causality but the appropriate response required further analysis. The pathway was analyzed, literature reviewed and then the GBS-test was validated and tested (probing) in collaboration with the Dept. of Microbiology before the guidelines for postpartum observation were changed in collaboration with neonatologists.	Complicated	Clear	Required learning	Staff supported by managers	Adaptive and technical	Analyze Respond Probe Analyze Respond

23	23 OB Medical induction	Complex situation with a problem definition that requires learning, i.e. too many admissions for medical induction, too long waits, and too many patients waiting in the EOC, all this prolonged treatment and disturbed patient flows. This was analyzed, and it became clear that improving medical induction was a complex situation that required further learning. Different improvement suggestions were developed and then probed, induction initiated in different locations of the department, with a faster medical regime or at different time in the day. Which lead to many changes being adopted.	Complex	Requires learning	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond
24	24 OB Normal birth	Complex situation with a problem definition that required learning. After analysis of the process maps for individual medical conditions, staff and managers realized that many patients in the EOC did not present with an emergency but "just" labor or came for induction of birth. The solution was to develop a pathway for patients in latent phase to be examined in the labor ward (Implementation of partus telephone) instead of EOC – this led to a more streamlined	Complex	Requires learning	Required learning	Staff supported by managers	Adaptive and technical	Analyze Respond Categorize Probe Sense Respond

		process for patient in “normal birth”.						
25	25 OB Preterm premature rupture of membranes PPROM	Complex situation with a problem definition that requires learning based on awareness that there was no evidence that admittance generates better outcomes. The response was developed through an iterative innovation process that including research and external partners, in testing and implementing home monitoring (CTG, blood pressure, temperature) –this process was led by a department senior doctor/professor, in a project about Tele-health – which he was part time employed in.	Complex	Requires learning	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond
26	26 OB Preeclampsia – (Previous severe or in current pregnancy) (Tele-Health)	Complex situation with a problem definition that requires learning based on awareness that there is no evidence that admittance generates better outcomes. The response was developed through an iterative innovation process including research and external partners, in testing and implementing home monitoring (CTG, blood pressure, temperature)	Complex	Requires learning	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond
27	27 OB Short cervix	Complex situation with a problem definition that requires learning based on awareness that there is no evidence that admittance generates better outcomes.	Complex	Required learning	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond

		The response was developed through an iterative innovation process including research and external partners, in testing and implementing home monitoring (CTG, blood pressure, temperature)						
28	1 OB multiple Fetal Growth Retardation	Complicated situation with a clear problem definition, too many unnecessary ultrasounds. The response was to update the categorization template so it was adjusted to the national guideline for Fetal Growth Retardation.	Complicated	Clear	Required learning	Staff and Management	Adaptive and Technical	Analyze Categorize Respond
29	1 OB org Referral external/ internal Redefined and expanded role for nurse coordinator in OOC (Gatekeeper) Midwife coordinator in MC (Gatekeeper) Partus telephone	Complex situation with a problem definition that required learning; for example, how to expand the role for nurse coordinator was unclear. The final response was to make that organizational role in to an overall gatekeeper for all acute/subacute referrals that covered several medical conditions. Midwife: Complex situation with a problem definition that required learning about the reasons behind too many unnecessary referrals from MC to EOC, and FMU. This was solved through an analysis of many outpatient pathways and the establishment of a midwife coordinator function in the MC (gate-	Complex	Requires learning	Required learning	Staff supported by managers	Adaptive	Analyze many pathways (outpatient care) Respond Probe Sense Respond

		keeper). A "partus telephone" was established, which allow laboring woman to contact the labor ward directly and on be referred through the EOC.						
30	2 OB org Change if the physical space of EOC	Complex situation with a problem definition that required learning – The problem was identified through the analysis of all the obstetrical pathways, too much transportation, inflexible staffing, waiting time, and too much activity in the EOC. The responses were developed in an iterative process of adaptive learning to improve the flow in the obstetrical department by dividing patient guided by their need for emergency vs. elective care, before or after birth ect. Furthermore, the new units that was created were relocated next to each other, which allowed for task shifting and task specialization and increased collaboration. These changes involved: Establish new obstetrical settings with 4 units (ABC, EOC, PW and labor-ward) in the same physical space.	Complex	Required learning	Required learning	Staff and managers	Adaptive	**Analyze** all pathways, Respond Probe Sense Respond
31	3 OB org Flow and capacity Changed staffing	Complex situation with a problem definition and a response that required learning. The response was developed through analysis of	Complex	Required learning	Required learning	Staff and managers	Adaptive	Analyze Respond Probe Sense Respond

		many pathways, combined with physical space-changes and a requirement to reduce nursing staff. It included task shifting of staff in the pregnancy ward from nurses to midwives; establishment of collaboration between midwifes and nurses in ABC, maternity ward and PH. A closer collaboration had a synergistic effect on competency levels – staff (nurses and midwifes) developed better knowledge and understanding about each other's competencies.						
32	4 OB org Faster discharge of obstetrical patient	Complex situation with a problem definition that required learning. The response was developed by reviewing multiple pathways and involving collaborators in other sectors, the ABC and PH. It included more formalized agreement of transfer off patients, early discharge with follow up in ABC and telephone hotline, children that could be treated in PH, accelerated discharge after CS, shorter observation for bleeding in pregnancy, individualized plans for vulnerable pregnant and home-network team and a culture change aiming to be able to discharge 24/7	Complex	Required learning	Required learning	Staff and managers	Adaptive	Analyze Respond Probe Sense Respond

		A “walking nurse” that handles PH-patients was included in this change						

Gynecology

Number	ID NUMBER	DESCRIPTION/SUMMARY OF ANALYSIS	CONTEXTUAL SITUATION	PROBLEM DEFINITION	IMPROVEMENT	PRIMARY LOCUS OF RESPONSIBILITY FOR THE WORK	KIND OF WORK	DECISION (WORK) PROCESS
33	1 GYN Fertility FAQ	Simple situation with a clear problem definition: Too many unnecessary telephone calls. The solution was developed through process mapping. And included expanding information on webpage with a FAQ.	Simple	Clear	Clear	Staff	Technical	Analyze Sense Respond
34	2 GYN Ascites drainage	Simple problem with a clear problem definition – too much waiting time for the procedure = unnecessary admission time. The response was developed through process mapping of several pathways (ovarian cancer, palliation and OHSS), which was developed through probing and knowledge sharing in teaching sessions. The response included that ascites drainage could be performed in the ward instead of OR and by all Gynecological specialists.	Simple	Clear	Required learning	Staff	Adaptive and technical	Analyze Respond Probe Sense Respond
35	3 GYN Cervical dysplasia	Complicated situation with a clear problem definition. Too many patients did not show up, got some double-info if they went to surgery, surgery was performed in GA, and too many very admitted after surgery. The response included changed visitation, longer opening	Complicated	Clear	Required learning	Staff supported by managers	Adaptive and technical	Analyze Respond

		hours, preoperative info via telephone, aligning info with DSU, use local anesthesia as when doing surgery instead of GA. Handling postoperative bleeding in EGC instead of OR. A gynecological-oncology specialist provides pathology answers via telephone.						
36	4 GYN Ovarian cancer	Complicated situation with a clear problem definition: too long admission and inability to reach the aim of the national cancer bundles. The response was developed through process mapping, a categorization that there was a need for highly specialized care, and establishing a closer collaboration with other department including new visitation guide, and faster mobilization after surgery, expanded surgical expertize (external training visits for surgeons), closer collaboration with other departments about postoperative care and follow-up. The collaborations were tested and developed over time.	Complicated	Clear	Required learning	Staff and managers	Adaptive and technical	Analyze Respond Categorize Probe Sense Respond
37	5 GYN Cervical Cancer	Complicated situation – with a clear problem definition: Too long admissions due to urine retention and a one-size fits all follow up. The solution was developed through pathway mapping and a combination of the use of the obstetrical walking nurse in the PH. That allowed urine retention to be handled in PH. Individual needs assessment	Complicated	Clear	Required learning	Staff and managers	Adaptive and technical	Analyze Probe Sense Respond
38	6 GYN Vulva cancer	Complicated situation with a clear problem definition: too long and sometimes unnecessary admissions. The response was developed	Complicated	Clear	Required learning	Staff supported by managers	Adaptive and technical	Analyze Respond Probe Sense Respond

		through process mapping and establishing a palliation conference and making individual plans and make admission in patient hotel an option.						
39	**7** GYN Advanced uro-gynecology	Complicated situation with a clear problem definition: A wish to avoid admission after surgery. The responses were developed through process mapping and an iterative implementation of an outpatient set-up that involved OR and the postoperative observation unit – clinicians largely drove the process. The solution involved changes in surgical procedure (nausea, pain), faster mobilization and establishing a day surgical unit in the OR. It was a long "prototyping" period with adaption – monitoring of admissions.	Complicated	Clear	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe Sense Respond
40	8 GYN Benign ovarian cyst	Complicated situation: Too much waiting time- for diagnostics and surgery – unnecessary visits – too long admissions. The response was developed through pathway analysis. It included that patients could have performed MRI in regional hospitals, changes in referral guidelines, reducing specialization level when cancer was not found. Full preoperative preparation in first visit, more minimal invasive surgery and faster mobilization and discharge.	Complicated	Clear	Required learning	Staff supported by managers	Adaptive and technical	Analyze Respond Probe Sense Respond
41	9 GYN Bleeding disorder	Complicated problem that led to unnecessary visits, too much waiting time for surgery – to long admission after surgery. The response was developed through pathway map-	Complicated	Clear	Required learning	Staff and managers	Adaptive and technical	Analyze Probe Sense Respond

		ping and probing improvement suggestions. Responses included the establishment of a central regions referral unit, new visitation guidelines. Standard surgical notes implemented and after surgery clear discharge plan should be present, to ensure smooth discharge all day (24/7). Fixed days for surgery and ambulatory for benign gynaecologist were implemented.						
42	10 GYN Endometrial cancer	Complex situation with a problem definition that required learning – to much waiting time, not achieving target for national bundles requirements. The response was developed through process mapping and included new referral guidelines, implementation of full individualized diagnostic and preoperative visit before and during the first visit. Diagnostic test (MRI, hysteroscopy) planned in the same day. Answer and plan from multidisciplinary conference could be given via telephone, blood compatibility testing done in morning of surgery day allowing to be admitted on day for surgery, more minimal invasive surgery (more robotic capacity) full postoperative plan written after surgery – reduced amount of follow-up visits at AUH	Complex	Requires learning	Required learning	Staff and managers	Adaptive	Analyze Respond Probe Sense Respond
43	1 GYN multiple Need assessment	Simple situation with a clear problem definition: That national requirement of individual needs assessment for cancer patients should be implemented. Change was to respond and follow this new external guideline.	Simple	Clear	Clear	Staff and managers	Technical and adaptive	Respond

44	2 GYN multiple Less gyn-cancer follow-up ambulatories /week. Reduced from 9 to 5(part of expanding surgical capacity)	Simple situation – with a clear problem definition: to many follow-up visits that specialist conducted instead of seeing newly referred bundle-care patients. Yet this prioritization was not something everybody agreed on. The response was developed and matured in an iterative process, however consensus was difficult to achieve – and changes was finally driven from top-management.	Simple	Clear	Required learning	Managers	Technical and adaptive	Sense Categorize Probe Sense Respond (top-down)
45	3 GYN multiple Patient meet in the same day	Complicated situation with a clear problem definition – to many pre-operative visits and a prolonged LOS due to admission the day before surgery. The response was developed through a review of pathways and made possible through new GOC settings – better coordination and collaboration that allowed patient to become fully preoperative ready in the first visit, much preoperative info can be handled via phone, blood compatibility test on the same day.	Complex	Required learning	Required learning	Staff and managers	Adaptive	Analyze Respond Probe Sense Respond
46	4 GYN multiple Weekly palliation conference	Complicated situation with clear problem definition. Too long LOS for palliative patients. The response was developed through analyzing pathways of palliative patient on the initial gyn camp.	Complicated	Clear	Required learning	Staff with support from managers	(Adaptive) and technical	Analyze Respond
47	5 GYN multiple Early mobilization after surgery	Complicated problem – to long admissions after surgery. Decision process: Pathways were analyzed and a pattern emerged that faster mobilization could make discharge after surgery faster complicated. The solutions included the	Complicated	Clear	Required learning	Staff supported by managers	Adaptive	Analyze Probe Sense Respond

		use of chewing gum, faster catheter removal. Faster physical mobilization and pain control.						
48	6 GYN multiple More minimal invasive surgery	Complex situation with a problem definition that required learning. As surgical technique developed that potential to reduce LOS by performing more laparoscopic surgery was used. This approach was used before the downsizing requirements – however the task of reducing beds could potentially had a synergistic effect which further reduced LOS. The response was to aim for all minimal invasive procedures to be performed as day-surgery, which was a pattern that emerged in the first camp. In analysis of many pathways this component was seen as a possible response, however the full potential was not systematically recognized in the initial analytical work.	Complex	Required learning	Required learning	Staff supported by managers	Adaptive	Analyze Respond Probe

49	1 GYN multiple Referral (external and internal) flow in the department: Changed visitation	Complex situation with solutions that required learning. There were unnecessary visits, cancer-bundles where target was not archived. To long waiting list in AUH- capacity in regional departments. The solution was developed through mapping pathways and was largely influenced by an "external" requirement to establish a regional referral unit and that the outpatient clinic should move to a new location in the department. Central referral unit, changed referral guidelines for cancer patients, no comfort scan in early pregnancy, emergency patient can be referred to other hospital if overbooked department and changing working hours for nurses. 1. Establish a regional central referral unit 2. Establishing extra ambulatories for bundle patients 3. Regional agreement that emergency patient can be referred to other hospital in case of a full department 4. Changed working hours for a nurse	Complex	Required learning	Required learning	Managers (and staff)	Adaptive and technical	Analyze Respond Probe Sense Categorize
40	2 GYN org Changes in physical space New gyn ambulatory setting.	Complex situation, with a response that required learning. Too much waiting time and unnecessary visits – lack of diagnostic capacity caused suboptimal care. The response was developed though mapping pathways combined with an external requirement to move location of the OGC where all subspecialties can be located in the same unit	Complex	Required learning	Required learning	Staff and managers	Adaptive and technical	Analyze Respond Probe Sense Respond

		1. Establish a new gynecological ambulatory with all sub-specialties in the same physical space – and available anesthesiology support. 2. Establish a coordinator nurse function for cancer bundles in the ambulatory. 3. Establish secretary teams located in ambulatory settings Changes were made in scheduling which were probed and adapted over time.						
51	3 GYN org Flow and capacity	Complex situation, with responses that required learning to develop. There was too much waiting time for surgery = unable to reach national bundle requirements. – many elements were included in responses, which developed over time in an iterative process where managers and staff rep. tested ideas, discussed effects and came up with new responses that included a weekly planning meeting and reallocation of staff resources away from follow-up ambulatories (9->5) towards more OR-lines, extra subacute ambulatories and shared OR-line between different subspecialist teams. Gyn. senior resident should supervise juniors in DSU (liberates specialists), more robotic surgery capacity and an expanded collaboration with abd. surgery was established. Surgeons, was developed in collaboration between DSU, OR, ward and subspecialized teams 1. Changed physician staffing in nightshift, which increased the	Complex	Required learning	Required learning	Staff and managers	Adaptive and technical	Analyze Respond Probe Sense Respond

		amount of specialist during the day shifts. 2. Expanded surgical capacity, more robotic surgery, more surgical lines and training of surgeons. 3. Establish a weekly planning meeting to ensure optimal use of ambulatories and operating theater.						
52	4 GYN org Better utilization of beds and faster discharge and Incl. a new nurse coordinator	Complex situation with a problem definition that required learning – LOS was too long and there were unnecessary admissions. The response (was developed through process mapping of all pathways and collaboration with other departments over time. The responses included expanded collaboration with regional departments, a regional contact person for each specific sub-specialty, (arrangements for moving patients home or to regional departments after highly specialized care is ended), ward rounds in the morning to make plans and discharge smoothly, move multi-disciplinary meeting to utilize bed-use, GP- physician sweeper-function, faster mobilization after surgery, advanced uro-gynecology as day-surgery, shared understanding of early discharge, involve relatives, ascites drainage in ward instead of OR, bleeding after conus handled in EGC, weekly palliation conference. 1. Formalized agreements with other department and	Complex	Required learning	Required learning	Staff and managers	Adaptive and technical	Analyze Respond Probe Sense Respond

		municipality about transfer of patients 2. New ward round routines to ensure smooth discharge 3. Establish a physician (GP-resident) support function to do ward round. 4. Establish a culture that facilitates discharge 24/7 5. Weekly palliation conference						
53	1 org both OB&GYN Quality and safety nurse	Simple problem with a clear problem definition.	Simple	Clear	Clear	Managers	Technical	Sense Respond